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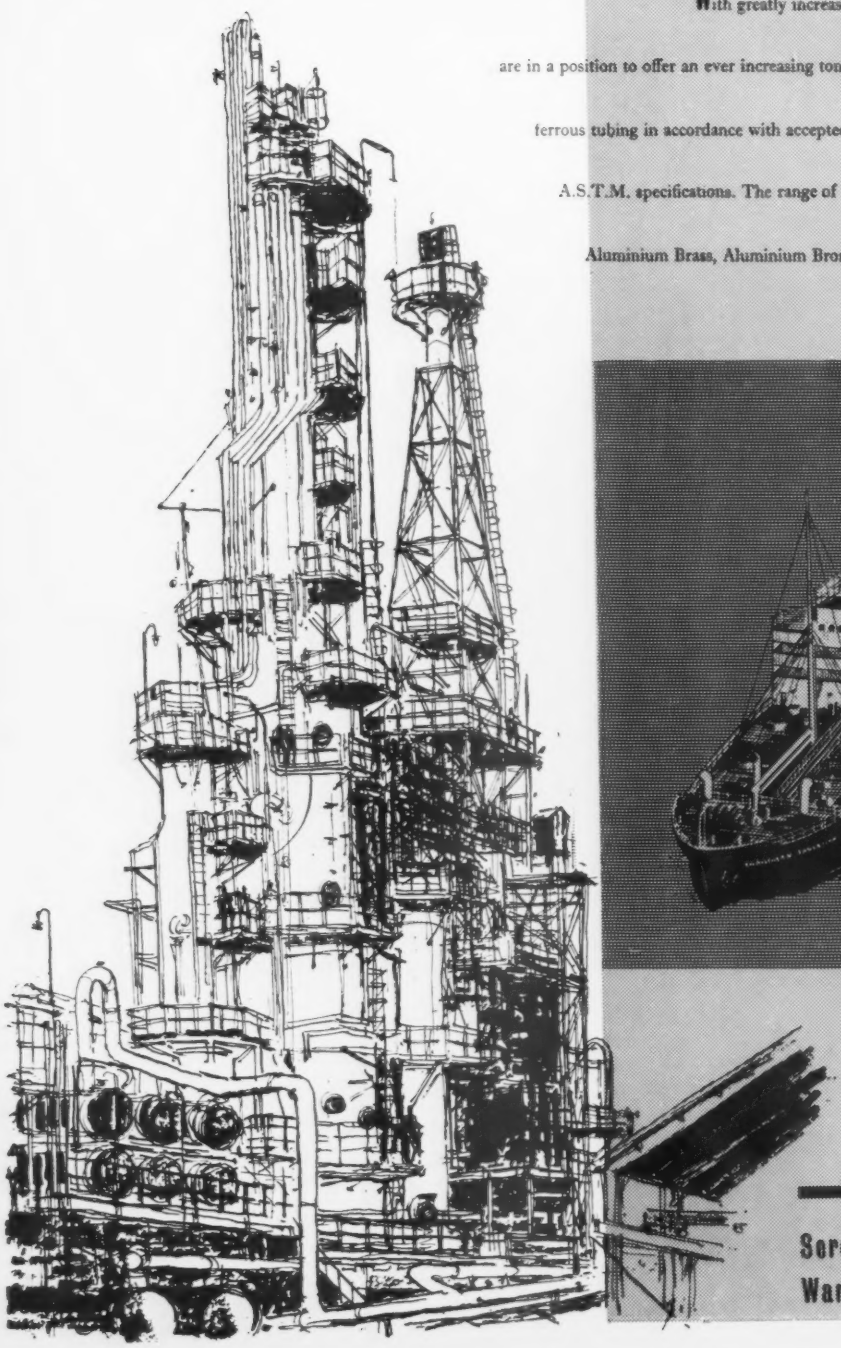

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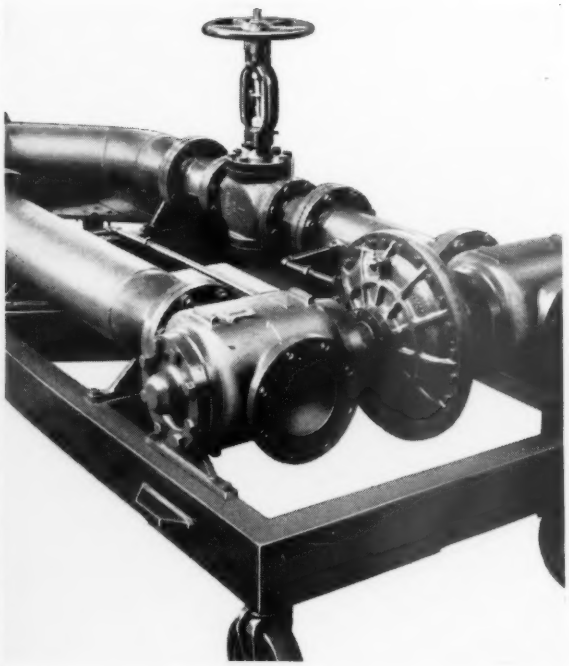

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Vol. 11, No. 128 **August 1957**

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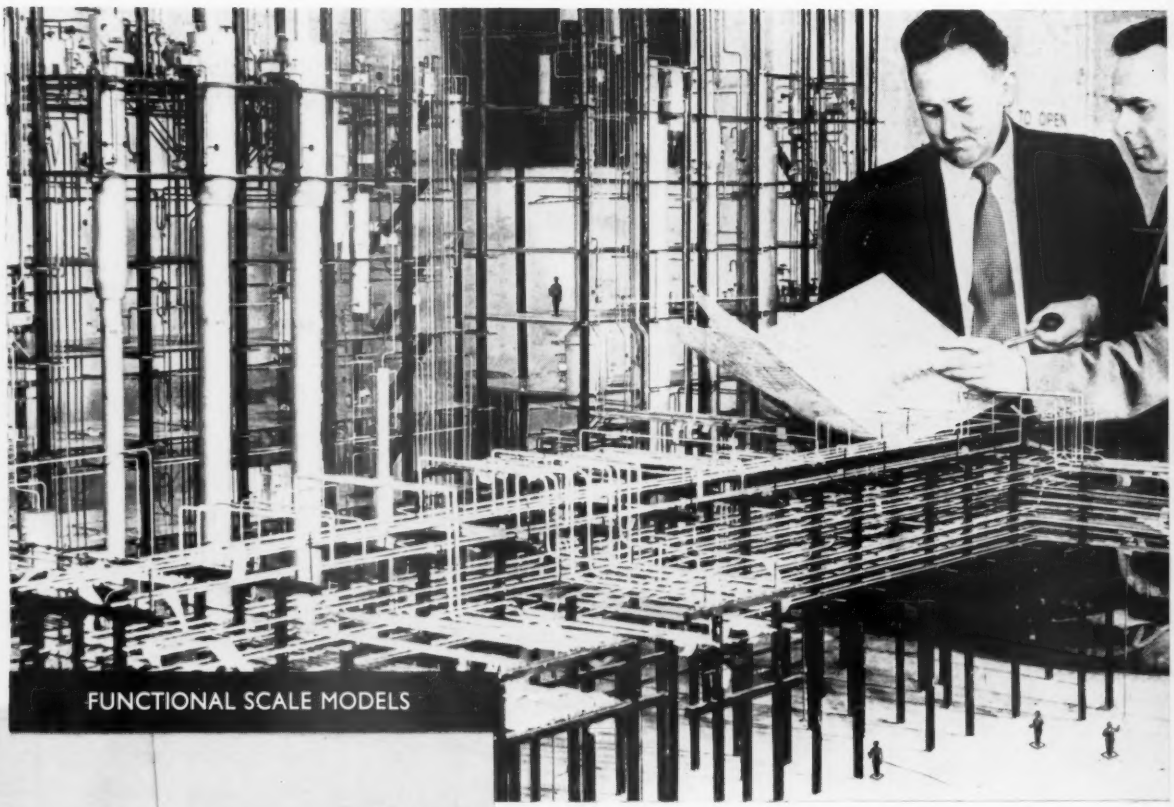

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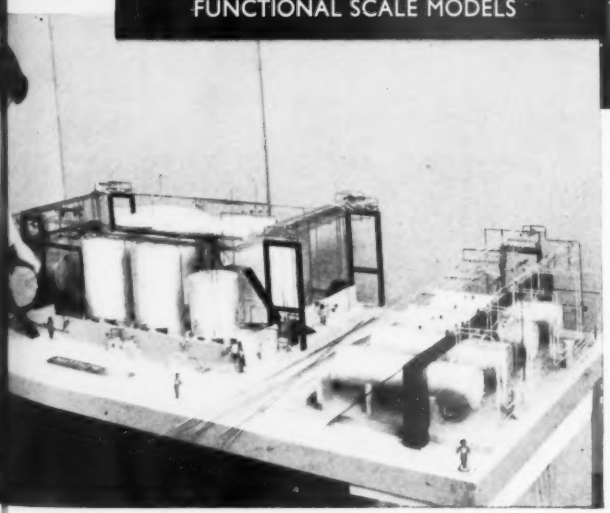

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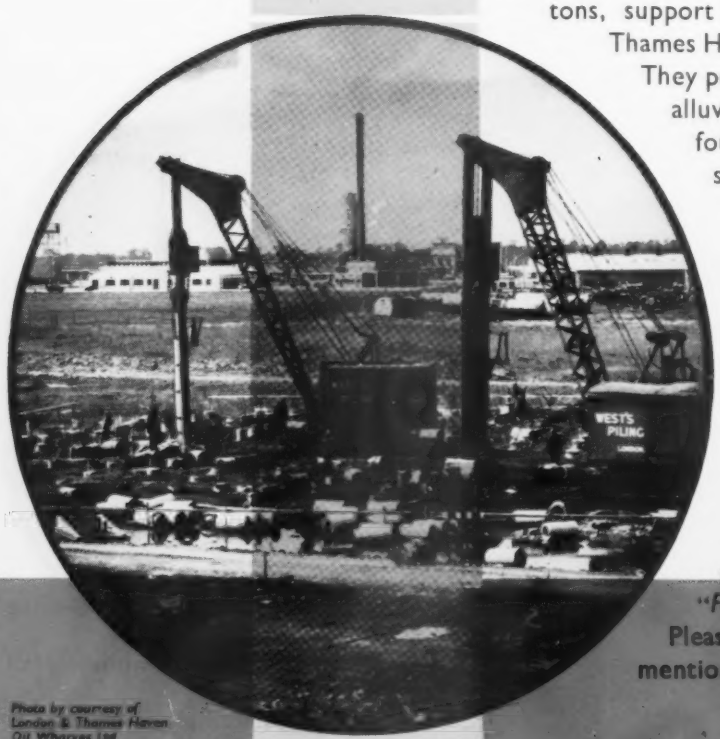

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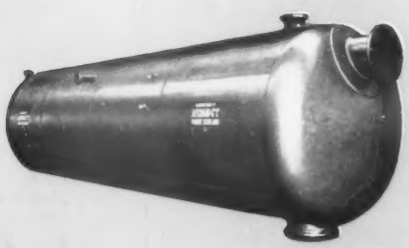

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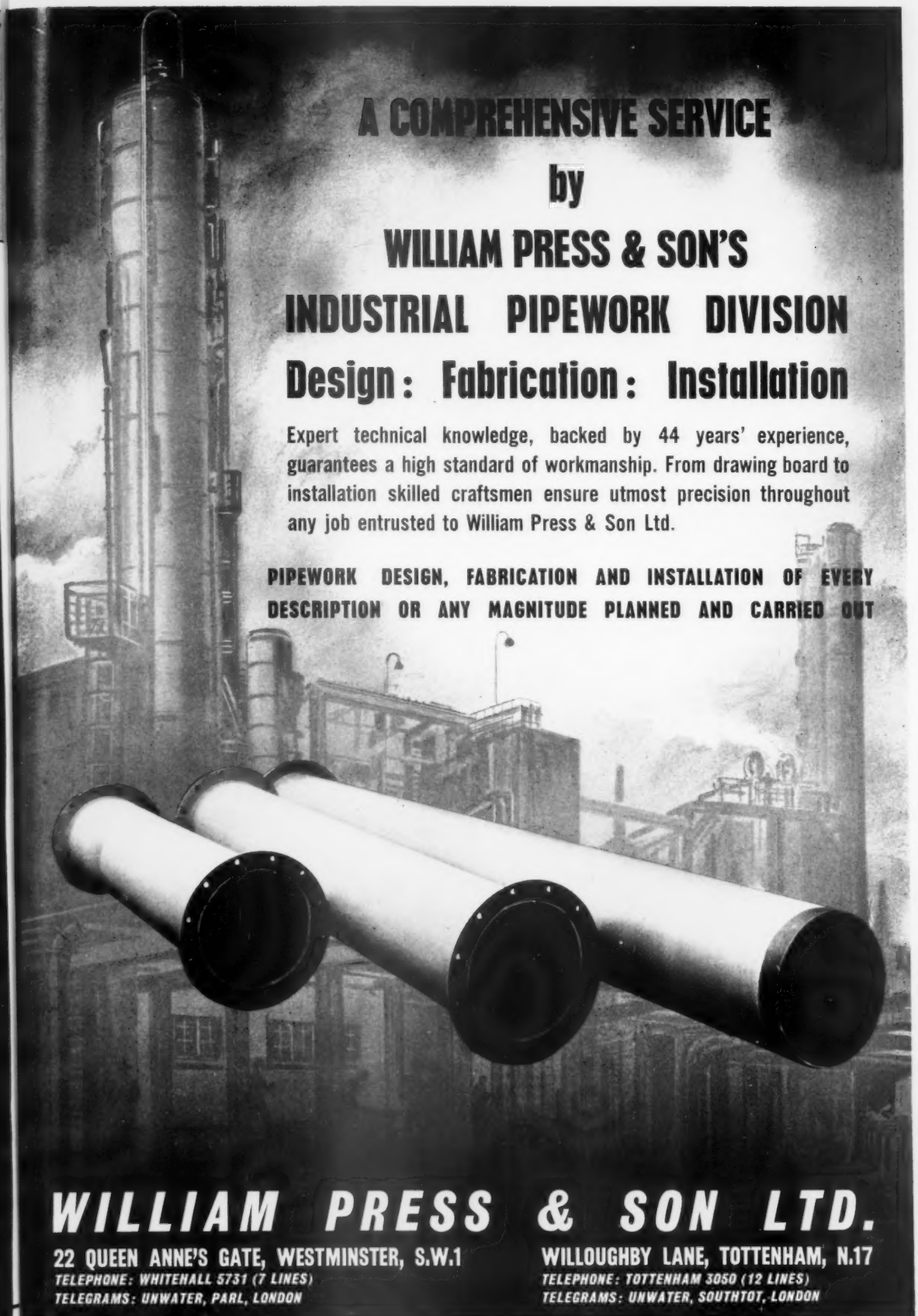

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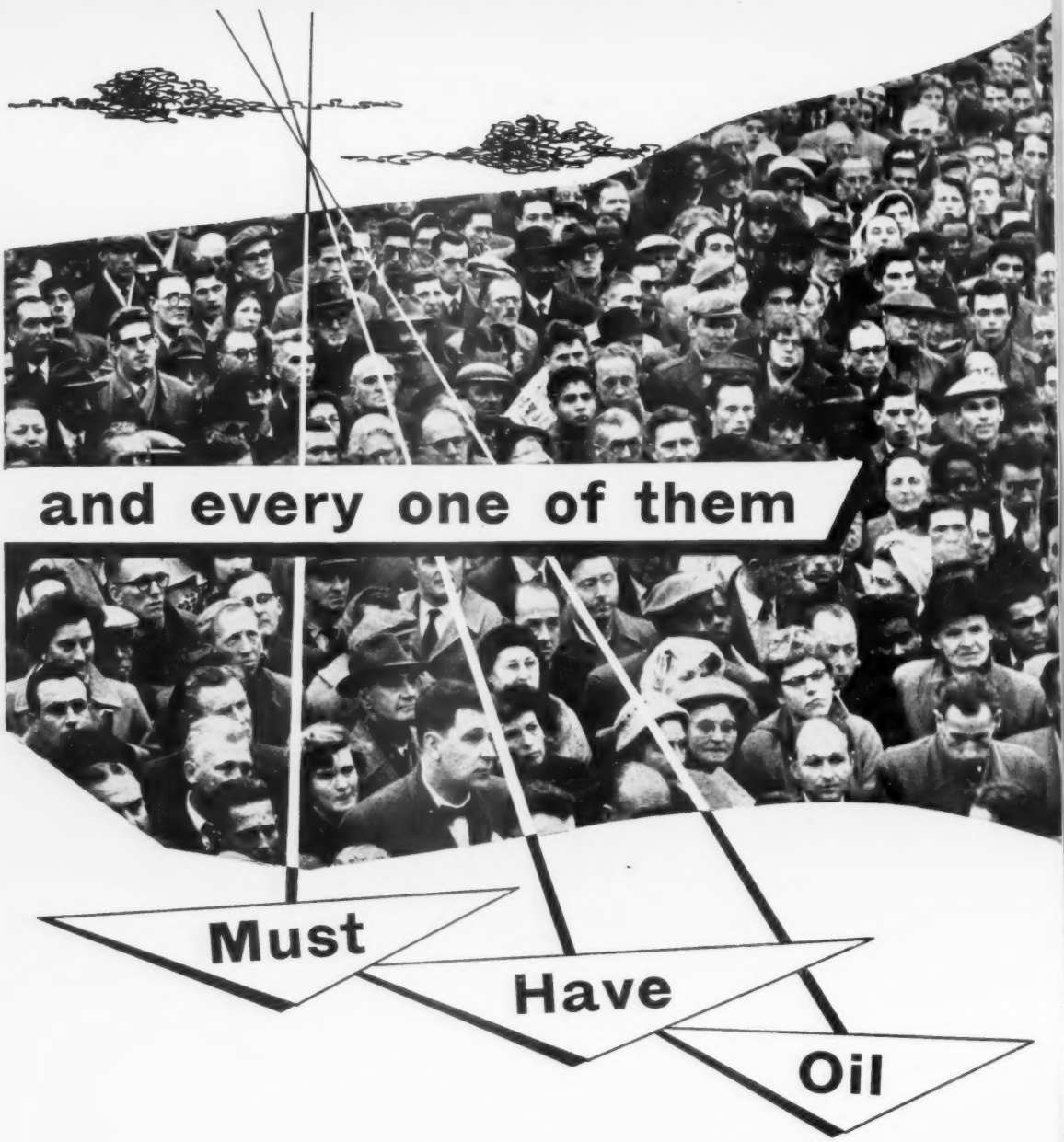

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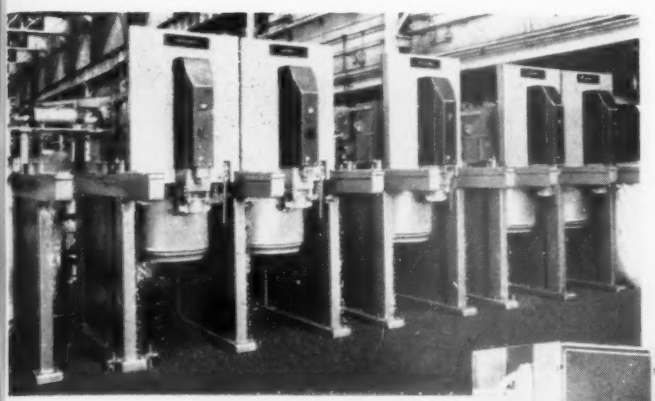

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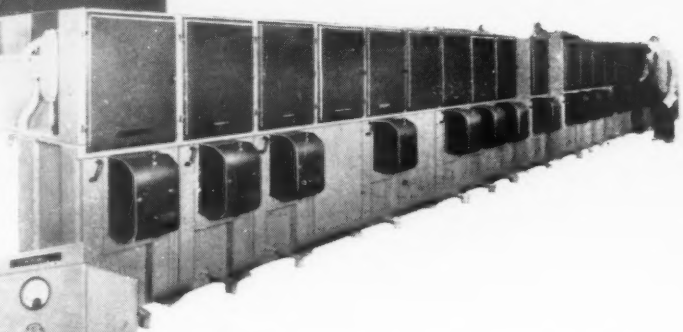
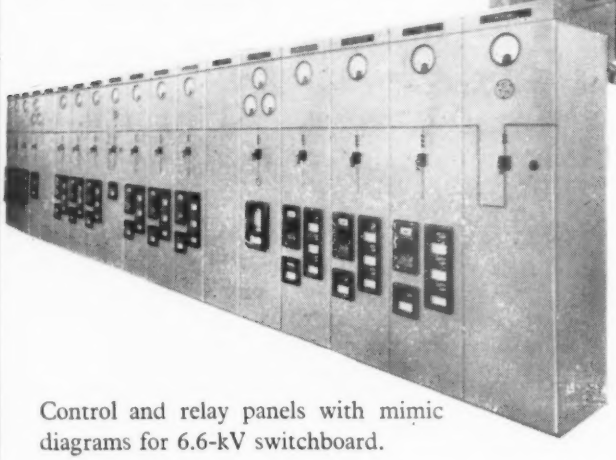


Twenty-panel, 6.6-kV, 250-MVA solenoid-operated switchboard controlling the 7,500-kVA transformers and main refinery feeders.



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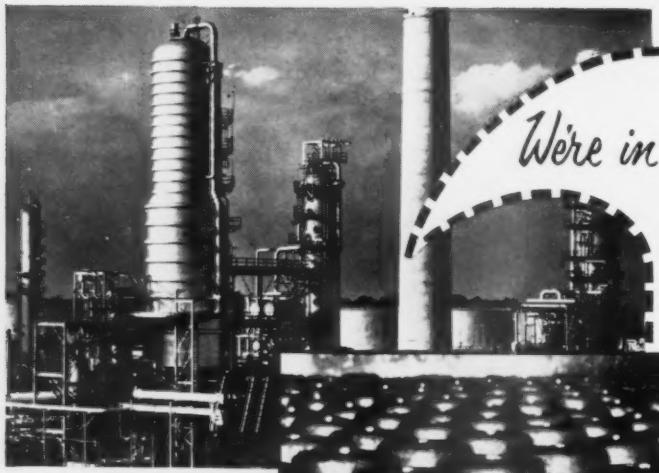

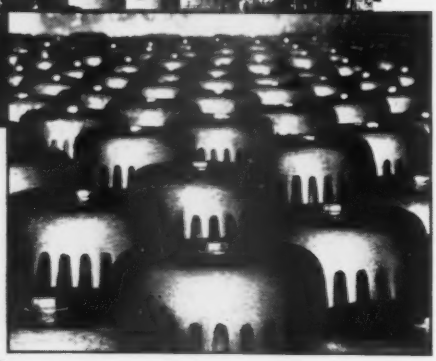

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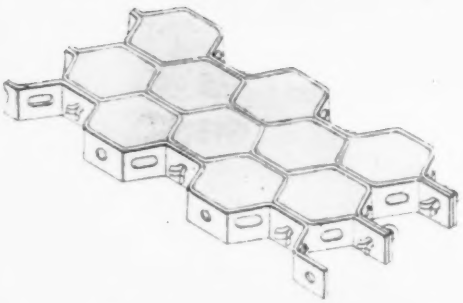

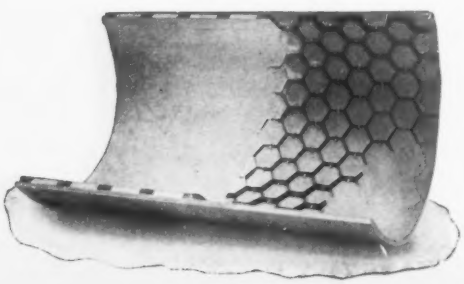

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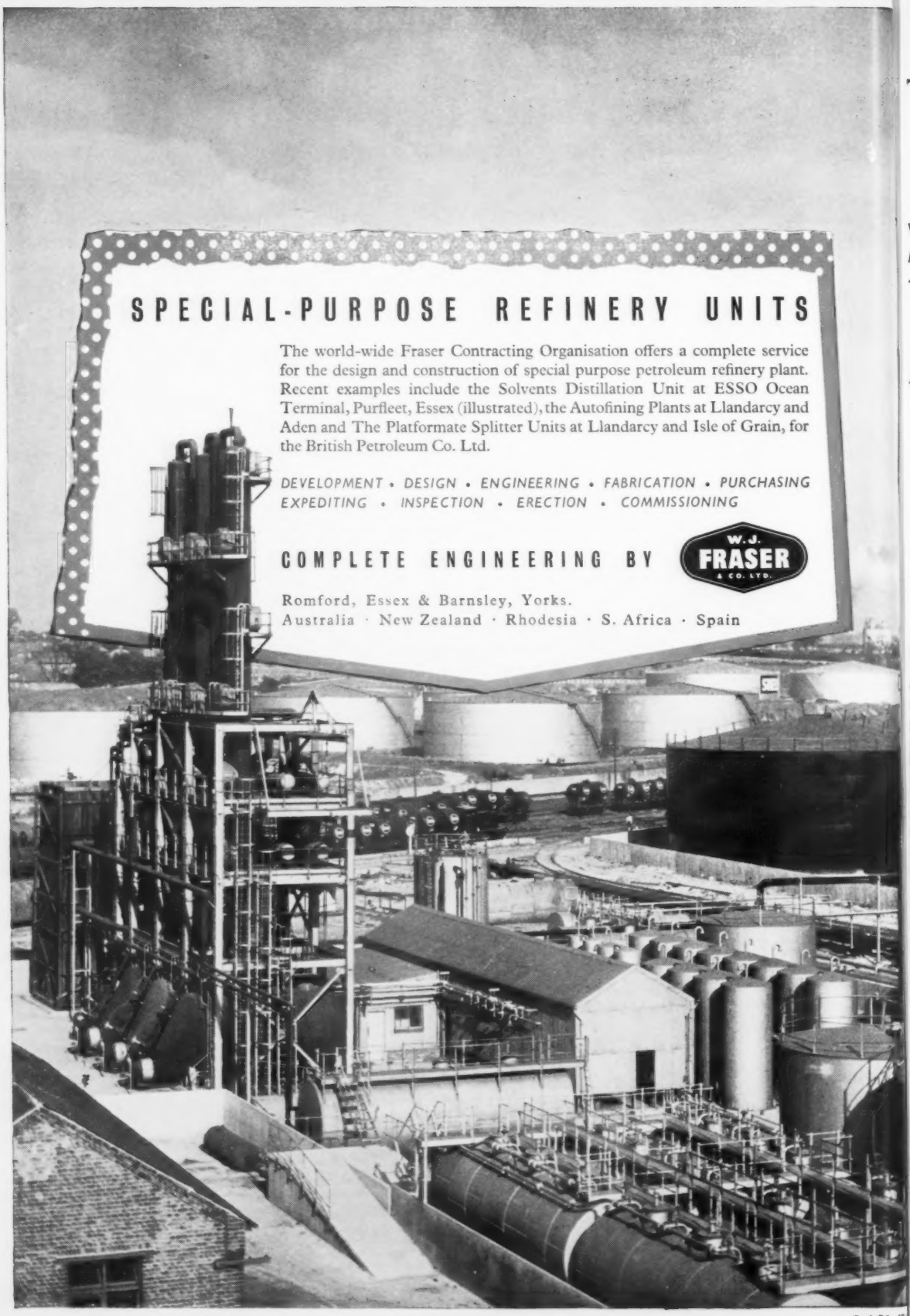
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Expansion in the World Oil Industry in 1956

Part 1

By **C. G. WATTS***

Each year, towards the end of the season, it is customary for the IP Economics and Operations Group to review the trends which have marked the progress made by the petroleum industry in the preceding year. The following survey for 1956 *was presented on* 16 *April.*

Before embarking on the main body of this paper, which covers in some detail the operations of the oil industry in the Free World as a whole, it is first necessary to put into perspective the size of the operations of the Soviet sphere, *i.e.* not only Russia but also China and the Eastern European countries.

Production in this area in 1956 reached a total of almost 100 million tons, which represents over 10 per cent of world production. The vast proportion of this oil was produced in Russia and in particular the Volga/Ural area, which was reported to have amounted to over 63 per cent of the whole of Russian production.

Whilst almost the whole of this oil was consumed within the Soviet sphere, nonetheless exports of crude and products were made to the Free World amounting to a new post-war peak of about 6 million tons, which was an increase of 1 million tons over the exports made in the preceding year. These exports, of course, represented only about 1 per cent of the total consumption of the Free World, but nonetheless most European countries received shipments from this area. Outside Europe the largest recipient was Egypt which, during the year, received over 1 million tons.

Free World Demand

In the Free World, once again, the consumption of oil products showed considerable expansion over the previous year, an expansion barely affected by the restrictions applied in Europe after the disruption of Middle East supplies. The full force of these restrictions was really only felt in the month of December and they were imposed in only one consuming area of the world, albeit a major consuming area. Throughout the rest of the world the increasing requirements of petroleum products continued unabated.

With this background and bearing in mind the rapid increase that had taken place in Europe in the first 10 or 11 months of the year, it is not surprising that demand for the Free World amounted to some 650 million tons, an increase of some 8 per cent over the preceding year, which equalled the average annual growth rate since the war. It was, however, a somewhat smaller rate of increase than had taken place during 1955 compared with 1954 and this can be attributed entirely to a less vigorous rate of growth in the U.S.A. In that country, whilst there was an increase of some 8 per cent over 1954, last year saw only an increase of some 3½ per cent. The rate of increase for 1955 was, however, unusually high.

Outside the United States, preliminary figures indicate that Free World demand in 1956 was well over 10 per cent higher than the previous year, an increase which maintained the rate of growth shown between 1954 and 1955. This means, therefore, that compared with the post-war rate of growth, whilst taking the Free World as a whole, the year was an average year, in the U.S.A. the increase was somewhat below its post-war average growth rate, and for the world outside the U.S.A. the growth was somewhat above the average.

In the world outside the U.S.A. the major increases in demand occurred in Europe and also in Canada. Whilst these were the areas which had the most spectacular increases, this expansion in demand occurred throughout

* The Shell Petroleum Co. Ltd.

the world; Latin America, Asia, and Africa all achieved significant increases over the previous year.

Pattern of Product Demand

Within these overall increases the pattern of demand for individual products showed certain changes from the pattern resulting from demand in 1955. These changes were to a large extent a continuation of the trend which was becoming apparent over the preceding year or two, namely that gasolines reflected a smaller share of the total demand, whilst the share of the heavier fuels—gas/diesel and fuel oil together—increased at the expense of gasoline. Whilst this change was most apparent in the Free World outside the United States, in the United States there was only a slight decline in the share of demand held by motor gasoline, for the increase in the share of gas/diesel was counterbalanced by a decrease in the share of fuel oil. Outside the United States, however, whilst fuel oil showed the largest quantitative increase, it is interesting to note that gas/diesel showed a greater rate of increase—in fact, as far as inland trade was concerned, taking the broad consuming areas mentioned earlier, in all of these except Europe, gas/diesel increased to a greater extent than fuel oil, both as a percentage over the previous year and in absolute quantities. In Europe, however, the story is different, for here the increased demand for fuel oil was predominant. It is not necessary here to do more than sketch in the causes of this change in emphasis from light oils to heavier products as they were well covered by Miller and Inglis,* but there are two main contributing factors. As a result of the continued economic growth since the war, both in the industrial and in the more under-developed countries, there has been a consequent general increase in demand for all products.

Superimposed upon this are two conflicting tendencies. First, there is the retarding effect upon the consumption of motor gasoline of the high rate of taxation and as a contrasting influence there is the much publicized "energy gap", primarily created by the inability of the coal industry to maintain its historical share of demand for energy fuels; and this is particularly evident in Western Europe. This has resulted in an additional demand for oil products, which, as one would expect, has fallen upon the heavier fuels.

Bunkers

Whilst it is customary to think of this sector of consumption as having a dampening effect on the more vigorous growth of inland trade, in 1956 in the Free World as a whole, bunker trade increased the more rapidly of the two, an increase that was predominantly fuel oil. The dislocation of normal supply routes at the end of the year caused considerable changes in the location of this demand, with bunkering ports in South and West Africa and the Atlantic Islands more than doubling their rate of throughput in the last months of the year.

Quality

Masked by such overall terms as "gasoline" and "gas/diesel" has been the continued improvement in the quality of products. Whilst everyone is familiar with the improving quality of motor gasoline marketed to meet the needs of modern engines with their increasing compression ratios—the introduction of 100 octane motor gasoline in the U.K. is an example of this—the continued improvement in the quality of other products must not be forgotten.

Increasingly too, it is becoming necessary to reduce the sulphur content in automotive gas oil; for aviation purposes fuels are required of high-temperature stability, and lubricants quality is in the direction of higher operating temperatures, rates, and speeds of machinery to be lubricated. To provide this improved quality and indeed to provide the overall requirements for each product, using this word in its broadest sense, meant that there was no slackening in the building of additional refinery facilities.

Refineries

Throughout the world in 1956 crude capacity at refineries expanded at a rate comparable with that for product demand. This took the form of new refineries—there have been ten of these outside the U.S.A. in nine different countries—and also of extensions to the capacity of existing plants. Whilst the increase was world-wide, with the greatest percentage increase in the Far East, the trend of recent years, whereby refineries tend to become more and more located in consuming areas, has continued. However, it is notable that in 1956 there was no refinery completed in an area where one did not exist before and which had previously imported its products.

As well as the additional crude capacity which was erected, the construction of specialist units continued apace with the emphasis once again on reformers. Of these, twenty-five were completed in ten different countries as against twelve catalytic cracking plants. Additionally, some eight hydrodesulphurization units were completed during 1956 and many more are under construction.

Production

To meet the increased product demand and its associated refining expansion, crude production for 1956 showed an increase, outside the Soviet sphere, of well over 50 million tons. Looking at the year overall, this increase occurred primarily in the United States, followed by Venezuela and Persia. For once, the increase in Middle East production was not so great as in Venezuela. The only reason, however, was the restriction brought about through lack of transport facilities in the last two months. Prior to this disturbance, levels in all Middle East producing countries were considerably above those for the similar period of the year before.

As far as new areas are concerned, in 1956 production started in commercial quantities in Israel, Angola, Sicily, and Gabon.

Exploration

In order to satisfy the needs of the oil industry in future years, exploration continued unceasingly throughout the world, with the result that by the end of the year production could come from areas which have never before been on the list of producing countries. An encouraging find was made in Nigeria, an oil discovery was reported from Costa Rica, and the possibilities of large production from the Sahara have been very widely publicized.

In addition to these finds in new areas, exploration has continued in known producing countries and there was a major discovery at Qum, in Persia. The U.S.A., Canada, Iraq, and Saudi Arabia all showed further indications of potential production and in Venezuela new concession areas were granted and exploration activity in them has already commenced.

* Miller, D. E., and Inglis, K. A. D., *Inst. Petrol. Rev.*, 1956, **10**, 153.

Part 2

By **F. POWELL**†

Oil Movements—1956

To keep pace with the growth of world demand for petroleum last year, total movements by sea of crude oil and products rose to about 500 million tons. If U.S. coastal shipments are excluded, the quantity of oil that moved in international trade totalled about 380 million tons—about 60 per cent being in the form of crude. Within this figure for international movements the Middle East and the Caribbean producing centres exported 150 million and 130 million tons respectively.

By far the greatest proportion of all Middle East shipments flowed into the West of Suez area—mainly Europe—via the Suez Canal and from the Eastern Mediterranean shipping terminals. From the Caribbean area about 40 per cent of all exports moved into North America, with the United States taking the lion's share and importing no less than 25 million tons of crude and 24 million tons of products, substantially weighted towards fuel oil.

First Ten Months—1956

In the first ten months of 1956, although the bulk of the oil needs of the Eastern and Western Hemispheres was met by shipments from within their own spheres of influence, there were considerable inter-hemisphere movements. From the Middle East, crude moved into North and South America at the rate of 20 million tons per annum—over two-thirds of this quantity being imported by the U.S.A. From the Western Hemisphere, Europe and other West of Suez countries imported about 30 million tons, mainly crude, fuel oil, and distillates from the Caribbean area.

European Supplies

At this point, it is necessary to highlight the dependence of Europe on the rest of the Free World for its petroleum supplies. First and foremost, Europe is the biggest oil-consuming market outside the United States and Russia. Secondly, less than 10 per cent of its requirements emanate from within its own borders. From January to October, demand had been running at an annual rate of 145 million tons, and of this quantity nearly 70 per cent of supplies came from the Middle East and 20 per cent from the Western Hemisphere. That was the broad position before the Suez Canal crisis. Now consider the problems which arose when the crisis broke and the measures taken by the industry to overcome Europe's supply problems.

Disruption in Supplies

Following the closure of the Suez Canal and the sabotaging of the Iraq pipeline system, the normal supply route for Middle East oil to Europe—with the exception of supplies through Tapline—was disrupted and this area was faced with the problem of replacing over 7 million tons per month, or about two-thirds of its total supplies, either by shipping Persian Gulf oil via the Cape of Good Hope, a distance of some 11,000 miles, or by Western Hemisphere oil some 4000–5000 miles sailing distance away.

To have relied on the Cape route would have meant 80 per cent more tankers being employed than had been used previously on the Middle East to Europe run. This, of course, was out of the question as no such reserve of tankers existed. In fact, at the time of the crisis, the whole of the world's active tanker fleet was fully employed.

The solution was obvious but not easy to implement. It was this:—

(1) To maximize the effective use of tankers, *e.g.* by eliminating as far as possible the Middle East shipments to the Western Hemisphere in such a way as to offset the reduced tanker-carrying capacity occasioned by the longer journey round the Cape, and

(2) To acquire additional supplies from the Western Hemisphere which in turn would allow for a saving in tanker capacity because of the shorter haul involved.

The effect of these measures was such that in the last two months of 1956 Europe was receiving supplies at the annual rate of 130 million tons. But the pattern of supplies had changed. Whereas previously the Middle East supplied 70 per cent this proportion dropped to just over 40 per cent, whilst supplies from the Western Hemisphere increased to over 45 per cent. Whatever the final outcome is of the Suez Canal crisis, it has in fact demonstrated, once again, the high degree of flexibility within the oil industry.

Tankers and Freight Rates

With the sustained increase in demand for oil during 1956, it was anticipated that the balance between supply and demand of world tanker tonnage would become very much closer by the end of the year. This position was further accentuated by the Middle East emergency. With the Suez Canal closed and the I.P.C. lines out of action, the need to re-route tankers on the longer haul round the Cape naturally imposed a severe strain on the world's tanker-carrying capacity.

With the general tight position of tanker tonnage, spot tanker rates were accordingly at a fairly high level right up to the time of the emergency, when they then rocketed to an all-time highest. However, the various methods of meeting the situation have begun to have effect with a consequent general easing of the position.

At the end of 1956, the world tanker fleet amounted to some 45 million deadweight tons. During the course of last year orders placed for new buildings reached the stupendous total of 19 million tons. Of this no less than 12 million tons were ordered during the second half of 1956, the troubled conditions in the Middle East having been an added impetus to the building of tankers. At the end of 1956 the world order book totalled 30 million tons, moreover, a further 6 million tons has so far been ordered this year. The majority of this new tonnage is scheduled to be delivered by 1962.

Pipelines

Although no major additions to pipeline capacity took place in 1956, work started on a number of expansion projects and new pipelines.

† The Shell Petroleum Co. Ltd.

In Saudi Arabia, construction started on a new line from Safaniya field to the Ras Tanura offshore shipping terminal, with an initial capacity $2\frac{1}{2}$–$3\frac{1}{4}$ million tons per annum, increasing later to about $6\frac{1}{4}$ million tons per annum. This line is scheduled to commence operations this month (April). Work also started on the scheme to increase Tapline capacity to over 20 million tons by the installation of additional pump stations.

Of special significance to Israel's supply position is the recent completion of a crude pipeline from Eilath on the Gulf of Aqaba to Beersheba, work on which started only in November of last year. For the time being crude oil will be transported to Haifa refinery by rail tank car, but it is proposed to extend the line to the coast.

Export Product Prices

During the first ten months of 1956, export product prices had remained reasonably steady. The Middle East crisis, however, placed an additional product demand on the Western Hemisphere and it was inevitable that as a result of the increased demand from Europe a general rise in product prices would take place in the Caribbean and U.S. Gulf—the two main potential sources of product supply to the international markets.

The most outstanding rise took place in the price of heavy fuel oils, which rose from $2·10 to $2·40 per barrel in early December and has since risen to $2·75. Middle distillate fuels also showed substantial gains and the average price for the year for light fuel was 10c per barrel higher than in 1955 and gas oils some 15c higher. In the gasoline market the large stocks in the U.S.A. had a dampening effect and the prices for lower octane grades remained fairly static. Here, it is interesting to note that since the closure of the Canal, prices for the lower grade gasolines are now below that for kerosine.

These price changes and their weighting towards the heavier products reflects the pattern of Europe's additional requirements (mainly residual fuel and distillates) and the fact that the U.S. oil industry was called upon to satisfy a pattern of demand which is considerably different from its own.

Export Crude Prices

In the crude market the prices of the heavier Venezuelan crudes increased towards the end of the year, thus also reflecting the additional demand for heavier fuels and this was followed by a general increase in the price of all crudes during January of this year. In the Middle East the prices for Saudi Arabian and Iraq crudes at Eastern Mediterranean terminals moved up 23c per barrel in December, to reflect the effect of tanker freight rates on the price relationship between crude from Persian Gulf and East Mediterranean sources. In the U.S.A. the first general crude price increase since June 1953 took place early in January 1957 and averaged about 35c per barrel.

Link with the Future

It seems unlikely that the continued expansion in demand for products shown over the post-war period will be seriously affected by the recent restrictions that have taken place in Europe. Seeing that these have affected three months of 1957, expansion this year may in the event prove to be somewhat lower than for past years, but by the end of the year it seems probable that consumption will have reached the level that might have been expected had there been no disruption.

At least for the next few years, the combination of additional product requirements resulting from the generally expected continuing economic growth, together with added requirements caused by the shortage of other energy products, should ensure that the growth potential for petroleum products is virtually unimpaired.

From what has already been said, it seems fairly certain that there will be sufficient crude oil available to meet any expected increase in demand, and that production may be more widely spread across the world than hitherto. Despite the increasing number of producing countries, however, the Free World will undoubtedly continue to rely mainly on the three major producing areas, namely North America, the Middle East, and Venezuela.

The growth in oil demand in the future will pose many problems of supply and transportation. The immediate link with the recent past naturally concerns the movement of oil from the Middle East, especially in view of that area's large oil potential and the role it will need to play in bridging the Free World's supply gap. It is apparent that the general effect of the Suez Canal crisis on the oil industry's operations has been to provoke some lively discussions regarding the future capacity of the Suez Canal.

Only last month top level discussions took place between eight international oil companies regarding the possibility of constructing a pipeline system from the Persian Gulf through to the Turkish seaboard. Considerable thought has also been given to the use of giant tankers for transporting Middle East oil round the Cape of Good Hope.

In certain other areas the industry has been preoccupied in planning new pipelines and in particular the European pipeline project which is being planned to carry crude from Marseilles to many other points in Europe.

The year 1956 was a good year in regard to expansion in the oil industry and within this year have been seen the beginnings of proposals and discussions which link it very firmly with the future.

DISCUSSION

In opening the discussion on the paper, W. Jamieson said that in normal times the "supply boys" lead a very hectic life and yet seem able to take in their stride a disruption, such as the Suez closure, which must increase many times the work they have to do. The authors had mentioned the flexibility of operation of the oil industry but this flexibility could be used only by the operations staff who had done a tremendous job in the past few months.

Effect of Weather on Consumption

He thought that the oil companies had now got over the crisis, although the amount of additional oil that was calculated by the statisticians as being needed for the Western Hemisphere to meet full normal demand had not been forthcoming. This, he said, was partly due to the weather and the fact that real demand had probably been less than anticipated; but was there another reason? Had the efficiency of re-arranging supply revealed a hidden reserve of transport capacity above the statistical measure?

H. E. Barry agreed with Mr Jamieson but he felt it was very difficult to estimate with any accuracy what effect the weather had on the consumption of fuel oil and burning oil—it could have amounted to something in the order of 10 per cent. The cut in fuel oil imposed by the Government on industry in general was 10 per cent, but in the event deliveries by the oil companies had been some 20–25 per cent below normal.

C. G. Watts said that if next winter proved to be a more normal season than the past one, demands for fuel oil could be reaching the levels of the pre-Suez crisis—particularly if coal showed signs of scarcity again.

Effect of Price Increases

Mr Barry considered that the other factor in limiting consumption during the crisis had been price, which at its peak represented an additional 35–40 per cent on fuel costs. This had made many users seek ways and means of economizing, since by and large there was no hold up in production. There had also, he said, been the best part of a year's setback in the fuel oil conversion programme as a result of the Suez crisis.

On the question of price, C. G. Watts said that the increase was analogous to the shilling that was put on cigarettes—one cut down for a week or two, and then when the initial impact was over one tended to forget about it, and one was soon back again at the same rate as before.

G. P. Glass thought that Mr Barry was confusing the far-reaching effects of the mild winter on the course of oil consumption in the short-term with the effects of the Suez crisis on oil consumption in the long run. He doubted whether manufacturers in the U.K., who had converted to oil in the past, had been quite so successful in finding such marked improvements in their methods of using oil in such a short period. He felt it was a pity that the winter had been so mild—for when the Middle East was cut off to all intents and purposes, life went on as usual. He suspected that the weather was responsible.

The increase of 35c in the price of crude oil in the U.S.A. was mentioned by H. E. Barry who asked if it was thought that it would remain after the Suez crisis. F. Powell said that the increase was not due entirely to the Suez crisis but partly to a general rise in the costs of production, which had been taking place since the last general crude price increase some 3½ years ago. He did not think it likely that the present price would revert to what it was.

Western Hemisphere Supplies

Asked by W. Jamieson if he had reached any conclusions on whether it would be possible to again tap U.S.A. supplies in the event of future disruptions such as is currently being experienced, C. G. Watts said that there had been certain additional discoveries of potential crude production in the U.S.A. during the past year but taking the long-term view he thought that the increasing internal demands of the American market would make it fairly certain that no very large surplus capacity was likely to be available for the rest of the world.

Development of Nuclear Power

A factor which might effect fuel oil consumption, said H. E. Barry, was the speed up in the development of nuclear power. Until recently it had been thought that there would be 6 million tons of coal equivalent production of electricity from nuclear power in 1965, but Lord Mills had now stated that the figure would be 18 million tons. If this figure was achieved and coal production was up to estimates, fuel oil consumption in 1965 could be, in terms of coal equivalent, 12 million tons less than was estimated three months ago.

C. P. Dalton questioned whether the development of nuclear power would directly influence the demand for coal, rather than oil, at the point of impact in the electricity supply industry. He thought that if the National Coal Board achieved its production target, the easier supply position might present a valuable opportunity to redevelop U.K. coal export markets in Europe.

Since the development of nuclear energy had been a feature of 1956, J. H. M. Clark said he would like to elaborate Mr Dalton's remarks. It appeared likely that the nuclear energy power plants would initially replace the old, less efficient, coal-burning, base-load power stations, and therefore its impact would be primarily upon coal consumption and less upon oil. He agreed that, although coal production might rise in future, home consumption might decline in the face of nuclear power, and thus allow for a revived export trade in coal.

M. E. Hubbard estimated that a 3½ per cent rise in energy in the U.K., on the assumption that it might be all in electric power, would require a capital expenditure at a rate of £500 million p.a. if all that power was provided by nuclear energy. That was one of the reasons why nuclear energy was not going to cut the ground from under oil's feet as rapidly as might be thought.

G. P. Glass hoped Mr Barry had not given the impression that the additional 12 million tons of coal equivalent that would be available as the result of the enlarged nuclear power expansion programme, announced by Lord Mills, was a large figure nor that it would be at the expense of oil.

In regard to C. P. Dalton's suggestion, Mr. Glass said that the National Coal Board's production target for 1965 was 240 million tons but, judging from experience in recent years, the actual production might be only 230 million or even 220 million tons. In terms of the Board's overall programme, this represented a relatively small shortfall, but in terms of the figures in the nuclear programme, it would make all the difference between a very large increase and a relative small increase in the demand for fuel oil.

Conservation of Coal Resources

J. H. M. Clark suggested that a good case could be made out for the conservation of U.K. coal resources. This, he said, applied particularly to open-cast coal. The oil industry would perhaps be the principal beneficiary from such a policy, but it would also serve the long-term interests of the country. By adopting such a course there would be a reserve of more readily accessible coal available for use as and when strategic considerations, or disruption in oil supplies, required it. Such a policy would be in line with that adopted for strategic reasons in the U.S.A. in respect of its own oil resources. F. G. Thackeray disagreed with this suggestion as he thought that with the development of nuclear power in the next 20 or 30 years there might not be a requirement for a large, nor an increased, volume of coal.

Demand for Main Components

Asked by M. E. Hubbard if he would elaborate his views on the future growth of the two main components, *i.e.* the gasoline and the heavier-than-gasoline products, C. G. Watts said that assuming gasoline continues to bear a high taxation rate and that at least for the next 10 years there will be increasing additional requirements of energy fuels, then the change in product pattern of the past few years was likely to continue. It seemed certain that the heavier fuels must become increasingly the predominant partner as far as the world outside the U.S.A. was concerned.

Mr Watts added that people always seem to talk of fuel oil as being the product to be needed through shortage of other energy fuels. But gas/diesel was showing marked increases, particularly outside Europe, and also in Europe it was becoming more and more used for space heating purposes. In the less-developed areas, where fuel oil was of smaller significance, he said it was gas/diesel which was showing the more rapid rate of increase for additional automotive use, smaller power plants, and things of that sort. He thought it was inevitable that, for the next 5 or 10 years anyway, the darkening of the product pattern must continue.

The question of the possibility of gasoline availability being more than requirements was raised by Mr Brooks, who asked if the present idea of converting to domestic gas would have any significant impact on the problem. F. Powell replied that he understood the oil companies were giving considerable study to the question of surplus gasoline. The extent that the industry is successful in finding other end uses for gasoline would have an effect on the future demand of this product.

Ratio of Supplies

Mr Stevens enquired if it was envisaged that, when the Suez situation returns to normal, supplies from the Middle East would return to the pre-Suez ratio, or would Venezuelan crude continue to replace in some measure crude hitherto supplied from the Middle East? In reply, F. Powell said that on the assumption that the Canal returns to its pre-shut-down level, there would no doubt be a change in the present ratio of oil movements to Europe from the Western Hemisphere and the Middle East.

Asked by Mr Stevens if he would give details of the Western Hemisphere movements to Europe between Caribbean and the United States, F. Powell said that during the period January–October last year, exports of crude oil and products from the Caribbean were running at an annual rate of about 27 million tons. Over the last two months of the year—principally due to increased production in Venezuela—this rate was increased to some 45 million tons. Exports from the U.S.A. in the last two months rose to 14 million tons of crude and 11 million tons of products, compared with the pre-crisis rate of some 2–3 million tons of crude and products.

SCOTLAND CONSUMPTION OF PETROLEUM PRODUCTS

For the first quarter of this year, the total deliveries into inland consumption of petroleum products, excluding bunkers for ships engaged in the foreign trade, was 20,338 tons less than in the same period last year.

Figures published by the Petroleum Information Bureau on behalf of the U.K. Petroleum Industry Advisory Committee indicate that the decrease was largely attributable to decreases of 13,354 tons in aviation fuels and 30,748 tons in motor spirit (including motor benzole). Full details are given in the following table.

SCOTLAND DELIVERIES INTO INLAND CONSUMPTION OF PETROLEUM PRODUCTS (IN TONS)*

Product	*January to March*	
	1956	1957
Aviation fuels	48,212	34,858
Motor spirit (incl. motor benzole):		
Dealers:		
Premier grades	42,226	28,931
Standard grades	30,031	24,104
Commercial consumers:		
Premier grades	5,856	3,913
Standard grades	31,123	21,540
	109,236	78,488
Industrial spirits (incl. industrial benzole)	5,047	8,179
White spirit	2,756	2,636
Kerosine:		
Burning oil	22,488	20,037
Vaporizing oil	16,392	13,957
	38,880	33,994
Derv fuel	47,557	44,643
Gas, diesel, and fuel oils:		
Gas diesel oil	63,006	57,569
Fuel oil	115,815	121,754
Refinery consumption	50,053	46,702
	228,874	226,025
Lubricating oils and greases	17,749	17,112
Paraffin wax and scale	712	389
Petroleum gases	1,153	1,172
Bitumen	24,768	28,457
Other products	23,532	52,185
Total	548,476	528,138

*Deliveries for bunkers for ships engaged in the foreign trade are not included.

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MIDDLE EAST PRODUCTION

Tons

	May	*Jan.-May*
Iraq Petroleum Co. Ltd	973,259	2,691,390
Basrah Petroleum Co. Ltd	686,766	3,461,018
Mosul Petroleum Co. Ltd	46,252	104,983
Qatar Petroleum Co. Ltd	506,334	2,353,050
Iraanse Aardolie en Productie Mij	2,871,000	13,549,000

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for May was 1,277,000 tons, the total for 1957 being 6,836,000 tons.

HD OILS

The following additional oils have been approved by the Director of Chemical Inspection, Ministry of Supply, as complying with the requirements of Defence Specification DEF-2101-A.

Supplier and Supplier's Nomenclature	*OMD Grade of Oil*
Atlantic Union Oil Co. Pty Ltd	
Essolube HD-30	110
B.P. Trading Ltd	
BP Energol Diesel S.1	110
" " S.A.E. 10W	40
Arthur Brown & Co. Ltd	
Abcolite 30	110
Compagnie Française de Raffinage	
Total HD 0	40
" 1	110
" 0	330
" 0	110
Esso Petroleum Co. Ltd	
TSD 981	110
Gulf Oil (Great Britain) Ltd	
Brit-Gulf 50 HD	330
Liberty Oils Ltd	
Omegal D.M.30	110
Manchester Oil Refinery Ltd	
Primor Mil 10W H.D.	40
Mobil Oil Co Ltd	
—	110
—	60
—	330
Mobil Oil in Deutschland AG	
Servac 530 (EP6/288E)	110
Shell Petroleum Co. Ltd	
Shell Oil S.4942	110
Sternol Ltd	
Auto Deso H.D.30	110
" H.D.10W	40
Vigzol Oil Co. Ltd	
'A' Diesel Engine Oil S.A.E.30	110

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STANLOW BRANCH

Chairman for the 1957-58 Session is C. N. Thompson, and a new member of the committee, H. G. Freeston, has been elected in place of Dr A. J. Ham who has recently retired. A. S. Brooman has been re-elected honorary secretary and A. Cluer as honorary treasurer.

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BIRMINGHAM UNIVERSITY DEGREES

Degrees have recently been awarded to the following Student Members of the IP:—

Ph.D.	**B.Sc.**
A. Badakshan	N. F. Bibby
P. Mina.	P. D. Edwards.
N. K. Chakravarty.	G. C. L. Jones
B. Finlay.	D. Wilson.

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Drilling Business

A new house magazine under the above title has just been issued by the Loffland Brothers Company of Tulsa, Oklahoma, and it is intended that this magazine will be published regularly every three months. It is a well produced magazine illustrating drilling operations in many parts of the world and should be of interest to those engaged in that side of the petroleum industry. Communications should be addressed to the Director of Public Relations, Loffland Brothers Company, P.O. Box 1649, Tulsa, Oklahoma.

The President, the Rt Hon Lord Geddes, welcoming the delegates and their ladies.

Engineering Progress and The Oil Industry

The 1957 Summer Meeting Summarized

Again the IP Summer Meeting, this year held in the Grand Hotel, Folkestone, 29 May-1 June, was voted an unqualified success by all who had the good fortune to attend. It was generally agreed that the seven papers presented for discussion were of the high standard which has now come to be recognized as a condition for presentation at these meetings. As usual the social side, providing as it does excellent opportunities for the renewal of old friendships and the making of new ones, was well-arranged. It was also reported that some good golf was enjoyed by those who preferred, as T. Dewhurst put it in his closing address, to practise the "art of knocking one sphere 1·62 inch in diameter off another sphere 8000 miles in diameter and not vice versa".

Although the President of the Institute, Lord Geddes, was able to attend the first session, he had regretfully to leave before the end of the meeting. The following members of Council were also present: Lt.-Col. S. J. M. Auld, T. Dewhurst, F. H. Garner (past-presidents): Dr E. B. Evans (vice-president and honorary editor); A. C. Hartley, E. LeQ. Herbert, and E. J. Sturgess (vice-presidents): D. L. Samuel (member of Council and honorary associate editor; T. W. Mathias, J. S. Parker, Dr K. E. W. Ridler, A. J. Ruthven-Murray, and W. H. Thomas (members of Council). They were accompanied by Lady Geddes, Mrs T. Dewhurst, Mrs E. B. Evans, Mrs A. C Hartley, Mrs E. LeQ. Herbert, Mrs E. J. Sturgess, Mrs D. L. Samuel, Mrs T. W. Mathias, Mrs J. S. Parker, Mrs K. E. W. Ridler, and Mrs A. J. Ruthven-Murray.

The total attendance of members and their ladies was 134 and the meeting opened with a Cocktail Party on the Wednesday evening. This provided an opportunity for the first informal discussions and introductions and enabled the President to say a word of welcome to those who had travelled from overseas and from various parts of the U.K. to be present.

All technical sessions were well attended by appreciative audiences.

The Technical Sessions

For this meeting the Papers Sub-Committee had selected the general theme of "The Influence of Engineering Progress on the Oil Industry" and under this heading 7 papers had been contributed and were presented for discussion at the meeting. These 7 papers covered every branch of engineering and included one special paper on metallurgy.

The technical proceedings were formally opened by the President on Thursday morning and the papers were presented during three sessions, the chair being taken by the President for the first session, Lt.-Col. S. J. M. Auld for the second, and E. LeQ. Herbert for the third.

Civil Engineering

In this paper by A. C. Hartley, formerly chief engineer of the Anglo Iranian Oil Company, it was pointed out that the civil engineer plays an important part not only at the beginning but throughout the development of every phase of the petroleum industry. With such a broad canvas it was obviously not possible for each aspect to be dealt with in great detail, but Mr Hartley dealt with his subject in general terms under the headings of:

1. Site Investigation
2. Foundation, Structural, Marine, and Constructional Engineering
3. Underground Storage
4. Heating, Ventilation, and Air Conditioning

An interesting gathering—F. E. Wellings, Mrs Beeby-Thompson, Mrs Dewhurst, A. Beeby-Thompson, B. J. Ellis, Mrs Wellings, T. Dewhurst.

Under the first heading he referred to the considerable progress in soil mechanics during the last quarter of a century and indicated the value of these studies in the preparation of sites for the location of refinery equipment and storage tanks. Various types of piling were dealt with in the section on foundation engineering and the use of reinforced, prestressed, and post-tensioned concrete were discussed under the heading of structural engineering.

In the section on marine engineering Mr Hartley directed attention to facilities for dealing with tankers and pointed out that the largest tanker now visualized would require low water depths alongside of approximately 55 ft compared with a depth of 30 ft before the war. In this connexion he referred to the substitution of steel piles for timber and reinforced concrete and also mentioned the use of resilient fenders to protect the vessels when berthing. In regard to tankers themselves he directed attention to the

Light refreshment just after arrival taken in the lounge of the Grand Hotel.

design of moorings and to the increased rates of loading and unloading cargoes. He also mentioned the developments in the use of flexible hoses for offshore lines.

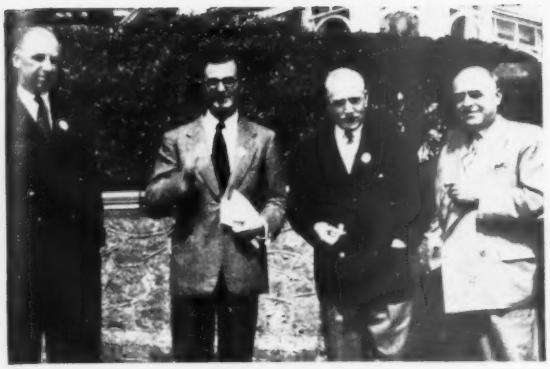
In constructional engineering, plant developments referred to by Mr Hartley included equipment for excavation, consolidation, concrete mixing, infilling, and the building of storage tanks.

Dealing with underground storage particular reference was made to the use of this type of storage for liquefied gas and figures of comparative costs were given. The paper concluded with some consideration of heating and ventilation of laboratories, dwelling houses, filling plants, etc.

Mechanical Engineering

E. J. Sturgess, chief engineer, Shell Petroleum Company, discussed the developments in mechanical engineering in all phases of the industry from exploration to final distribution of products. He pointed out that in 1956 the United Kingdom supplied to the oil companies about £541 million worth of equipment excluding tankers. In comparing refinery developments he illustrated the scale of progress in the last 30 years by comparing the continuous battery distillation plant operating in 1927 at the rate of about 600 tons per day and a fuel consumption of perhaps 4½ per cent of the throughput, with a modern plant which.

W. P. Given, Mrs Ellis, Mrs Given, P. F. Ellis, and Mrs J. Cummings ready for the dance.



J. N. Thompson, J. T. T. Robinson, Col. Oliver Sherlock, and Dr H. Harris take a breather between sessions.

he said, would have a capacity of 10,000 tons per day and a fuel consumption of about 2 per cent.

On the transportation side and in reference to pipeline construction Mr Sturgess suggested that it might be possible for a pipe to be fabricated on site from flat plates shipped to a strategic point on the route of a new pipeline. There had been considerable developments in road transport and although the antiquated road system in the U.K. limited the maximum size of a bulk road tanker to 4000 gallons there were in use abroad vehicles which would carry 7000 gallons at speeds up to 60 m.p.h.

There had been considerable developments in storage tanks and from the old riveted tank with a maximum capacity of about 12,000 tons there were now currently in use in the United States tanks 200 ft in diameter with capacities of 45,000 tons. Concluding, Mr Sturgess paid a tribute to the educational establishments which had produced the mechanical engineers and said that there was no doubt that the oil industry offered unlimited scope to mechanical engineers who wished to make it their career.

Marine Engineering

The paper by G. Trypanis of Niarchos (London) Limited was read by R. E. Dodds, the chairman and managing director of the Company, in the unavoidable absence of Mr Trypanis. The paper pointed out that at the beginning of 1957 the Free World's operating tanker tonnage was approximately 41 million dw tons, compared with just over 16 million in 1939. Tanker building to-day was from 18,000 to 100,000 dw tons with almost 85 per cent in the sizes of 30,000 tons and over. In 1939 vessels were generally between 6000 and 12,000 tons. In regard to operating costs it was pointed out that these did not rise proportionately with increasing size and it was estimated that cost of transportation by a 50,000 tonner was only about 60 per cent of that by a 12,000 tonner.

Various factors affecting the size of tankers were discussed and the paper then proceeded to deal with aspects of metallurgical research and welded construction.

On the question of propulsion units Mr Trypanis pointed out that the type chosen for most supertankers was the steam turbine, while in the medium size power ranges of up to 8000-10,000 shp, the diesels had taken a prominent place. With regard to the straight gas turbine he felt that the majority of the maritime world was not yet convinced that it could compete in prime cost with the steam turbine or the diesel, but he felt that a more promising line of development was that of the free-piston gas generator combined with the gas turbine. As for nuclear propulsion, although it had not yet reached the stage of development where it became commercially attractive, Mr Trypanis said that it had many advantages to offer.

A feature of the meeting was the presence of several members and their wives home from Kuwait.

On the subject of hull form of the future it was mentioned that a project was under study in Japan for a 30,000-ton submarine tanker. This type would have the advantage of lighter construction due to its circular cross section and of higher speed because of its streamline design. It took no great imagination said Mr Trypanis to visualize an almost automatic submarine, remote-controlled from a bridge space by a handful of men. A chain of these submarines could link refinery and oil-producing centre in a perpetual roundabout. On arrival at loading or discharge ports the ships would be taken over by trained shore crews until again ready to sail. This would help solve also the problems of the large crews needed on to-day's tankers.

Dealing with tankers for liquid gas Mr Trypanis discussed the question of transporting large quantities of gas from the Middle East. He suggested that if the construction of vessels for the transport of natural gas was not economically

Mr and Mrs H. E. Barry take cocktails with Mr and Mrs A. H. Stephenson.

Shell-Mex & BP and Shell get together.

possible it might be better to extract the butane and propane from the gas and transport those gases in specially constructed vessels provided with pressure tanks or vacuum-flask-type vented tanks.

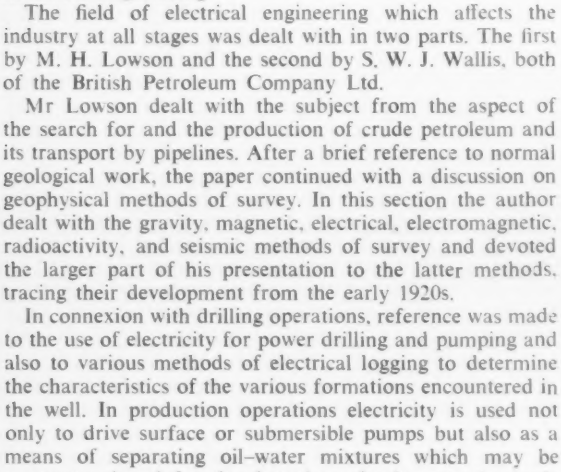
Electrical Engineering

The field of electrical engineering which affects the industry at all stages was dealt with in two parts. The first by M. H. Lowson and the second by S. W. J. Wallis, both of the British Petroleum Company Ltd.

Mr Lowson dealt with the subject from the aspect of the search for and the production of crude petroleum and its transport by pipelines. After a brief reference to normal geological work, the paper continued with a discussion on geophysical methods of survey. In this section the author dealt with the gravity, magnetic, electrical, electromagnetic, radioactivity, and seismic methods of survey and devoted the larger part of his presentation to the latter methods, tracing their development from the early 1920s.

In connexion with drilling operations, reference was made to the use of electricity for power drilling and pumping and also to various methods of electrical logging to determine the characteristics of the various formations encountered in the well. In production operations electricity is used not only to drive surface or submersible pumps but also as a means of separating oil–water mixtures which may be encountered and for the detection of salt water in crude petroleum. Similarly, in the field of reservoir engineering,

Mr and Mrs Norman Fraser and Mr and Mrs E. LeQ. Herbert watch the dancing.



the electric log is used for porosity measurement and also to determine flow patterns when a secondary recovery by water flooding is to be instituted in a depleted reservoir.

In dealing with pipeline operations Mr Lowson particularly stressed the importance of communications along pipeline routes and emphasized the value of micro-wave radio communication in the operation of long distance pipelines.

Electronics in the petroleum industry was the main subject of the paper by S. W. J. Wallis, who pointed out that the electronics industry had itself exerted no small influence on engineering design. After a brief reference to the use of electrical power in refineries in general the paper then dealt with the use of instruments for measurement and control. These are mainly electronic and include instruments for laboratory analysis in the refineries and also digital computers.

Dealing with telecommunications it was stressed that these are of considerable importance particularly for purely oil operations, such as between pump houses and jetties. Thus, attention was paid to the use of coded light signals in ship–shore communications during tanker loading operations and to the use of radio for communications in the field.

Dr and Mrs F. F. Musgrave sit out a dance with Mr and Mrs H. Fossett.

Discussing briefly the use of radioactive isotopes, some reference was made to the effects of irradiation on petroleum fractions.

Chemical Engineering

This subject was reviewed by Professor F. H. Garner and L. G. Miskin of the Chemical Engineering Department of the University of Birmingham. Their paper covered the last 40 years of developments in the field of chemical engineering, dealing first with distillation and pointing out that in the early days refining was merely a primary separation of petroleum products into kerosine and lubricating oil.

The authors then traced various developments in the field of chemical and physical refining from the time when James Young first refined shale oil over 100 years ago. Various aspects of chemical and physical refining and thermal and catalytic cracking were discussed and finally the authors had something to say on control of refinery operations and planning.

These three pictures indicate the welcome relaxation in the evenings and on the last night.

The authors concluded with a brief reference to the educational aspects of chemical engineering and stated that in the next five years the percentage increase in the demand for chemical engineers was higher than that for any other profession. A substantial proportion of these chemical engineers would be required by the petroleum industry.

Metallurgy

Throughout the reading of the papers and the discussions frequent reference was made to the metallurgical aspects of engineering in the petroleum industry. It was therefore fitting that one paper should be devoted to this aspect and that its author should be Dr H. Harris, the chief metallurgist to Babcock & Wilcox Ltd. With a reservation that his paper was not to be intended as authoritative in so far as the oil industry was concerned, the author had selected for discussion topics which were likely to stimulate the interests of the oil industry. In particular he dealt with welding, the importance of which in the oil industry is without doubt. It is essentially a feature in the fabrication of refinery plant, in the manufacture of pipelines, tankers, and other means of transport of petroleum and its products. This portion of the paper was particularly devoted to the mechanics of the cracking which could take place in the welding of low alloy steels.

The author also dealt with the high alloy steels necessitated by the development of the jet engine and the gas turbine and then discussed pressure vessels lined or clad with corrosion-resistant materials. Particular attention was paid to the very important phenomena of brittle fracture because of its incidence in tankers, storage tanks, and pipelines. Some information was given on work which is currently in progress at the British Welding Research Association.

Discussion

The meeting was noteworthy for the discussions which followed the reading of each paper and at no time was it necessary for a chairman to take steps to stimulate the audience. On most occasions, in fact, the chairman had to declare the discussion closed because the time limit had been reached. It is also of interest to record that all meetings were extremely well attended in spite of other attractions.

Vote of Thanks

In the unavoidable absence of the President it fell to T. Dewhurst, past president, to declare the meeting closed at the end of the final session. In doing so Mr Dewhurst said that the Summer Meetings had arisen from the first World Petroleum Congress in 1933 when many IP members from overseas had enjoyed the opportunity of attending the meeting in the summer in Great Britain. He had therefore arranged the first Summer Meeting to be held in 1934 and for several years thereafter the theme had been a discussion of the annual reports of the progress of naphthology. Following the war these meetings had been renewed and the present meeting was the fifth post-war Summer Meeting of the IP. He thought all would agree that it had maintained the high standard set at previous meetings.

They were indebted, said Mr Dewhurst, to the Papers Sub-Committee and particularly to its chairman, D. L. Samuel, for selecting the technical theme and for the collection of the excellent papers which had been presented. He himself was not quite sure whether the title should have been "The Influence of Engineering Progress on the Oil Industry" or "The Influence of Oil Industry Progress on Engineering".

Thanks were also due to the authors of papers, to the chairmen of the meetings and to the participants in the

Mrs Broom, Mrs Russell, C. L. Goodacre, Mrs Goodacre, A. M. Russell, and Dr W. E. J. Broom.

discussions, and to George Sell, who made the arrangements for the technical side of the meeting. They were also indebted to J. S. Parker for the film of his Middle East tour which he had shown the previous evening.

They were also indebted to the General Secretary, D. A. Hough, who had made the arrangements for their comfort and pleasure, and he was sure that those who had attended the two excursions would remember them with pleasure and interest. Finally, he said that he was sure they would all be looking forward to the 1958 Summer Meeting of the Institute.

Social Events

In contradistinction to the 1956 Summer Meeting the weather was a marked change even from that which prevailed in that part of the country a few days before. The sun shone and the wind dropped and it was almost warm.

On the Thursday afternoon most of the party went by coach to Canterbury, and after having tea at The County Hotel assembled at the main entrance for a "conducted tour" of the cathedral.

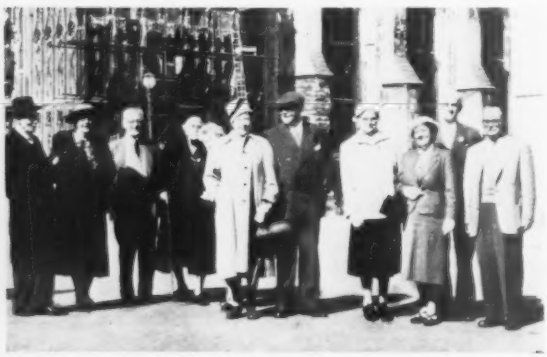
At least that is what the programme said, but very few members of the party will associate the expression "conducted tour" with the wonderful hour or so that followed. The guide round the cathedral was the Chief Steward and Treasurer of the Friends of Canterbury Cathedral, Miss M. Babbington, O.B.E., who explained the architecture and history of this glorious building in such a way that the allotted time seemed to be over almost before she had begun.

The party sat in the quiet of the choir, which was completed nearly a thousand years ago, and listened entranced as the old lady recounted the past of the cathedral and the great figures of history that had worshipped in it. She spoke of St Thomas a'Becket dying before the altar; of the visit of the youthful Henry V before his dramatic victory at Agincourt; and of the great tomb of Edward the Black Prince, with his achievements hanging above it. She also told of the monks who had sung through six services in the choir before their breakfast, and of the pilgrims who walked from the provinces of the kingdom to climb the steps to the great golden coffin of the martyred Becket, until finally Henry VIII dissolved the monasteries, and caused the bones of the martyr to be scattered.

Perhaps her most moving description was of the Archbishop who willed that two effigies should lie above his tomb; one in the full panoply of worldly power, clad in his robes of state, and the other beneath it, clad only in a winding sheet, showing him as he would look when he met his Maker.

Altogether a most memorable afternoon.

Some of the party outside Canterbury Cathedral.



The Hon. Editor (right), *the Hon. Associate Editor* (left), *and the Editor have every reason to be pleased with the result of their efforts.*

The ladies' excursion on the Friday was to Dover Castle, where an amusing guide showed the party round the keep, and dropped lighted flares down the castle well to show its incredible depth. Almost the whole party climbed the interminable winding staircase to the battlements and were rewarded by a glorious view of Dover Harbour under a cloudless blue sky, and a final visit to the oldest Roman building in the country—the Pharos Lighthouse, which was built in A.D. 43, completed a most enjoyable afternoon.

The Summer Meeting of the IP without golf would be an unnatural proceeding and one heard frequent reference to what had happened at this and that hole on the local golf course and gathered that some interesting and exciting matches had been played.

The final event was a cocktail party and dance on Friday evening and it was obvious that everyone present was really enjoying that function.

The Proceedings

As is usual, the papers and a full report of the discussion will be published in book form as soon as possible and an announcement will be made as soon as the book is ready. It is hoped to effect publication before the end of September or early in October at the latest.

Personal Notes

Captain Ernest Tyrrell has been appointed Commodore of Esso Petroleum Company's tanker fleet, which comprises 38 vessels of nearly three-quarters of a million deadweight tons.

His career has been spent entirely in the Company's marine service. He was first appointed Master in 1939, having obtained his Master's Certificate ten years previously. During the war, when in command of the M.V. *Seminole*, he sailed in many North Atlantic convoys, and for a year in 1942-3 he was Master of the s.s. *Bulk Oil* which was assigned to special duties with the Allies in the Mediterranean, a particularly lively period of naval activity.

In 1953 Captain Tyrrell was given command of the 26,000-dw ton *Esso Oxford*, the first of the Company's post-war supertankers, and last year he became Master of the 36,000-dw ton *Esso Columbia*. He is now on leave prior to taking the 36,040-dw ton *Esso Guildford* on her maiden voyage later this summer (see *IP Review*, 1957, **11**, 140).

R. H. Johns, editor of Mobil Oil Company's house journal *Mobilnews*, which was given an Award of Excellence in the National Competition for House Journals, organized by the British Association of Industrial Editors. There were more than 40 entries in Class A, to which *Mobilnews* belonged. Mr Johns is seen here with a background formed by three copies of the journal which he edits.

B. E. Adams, R. E. T. Clarkson, and **R. Marshall** have been appointed to the Board of Taylor-Short and Mason Ltd. They will combine with their directorships the offices of chief engineer, works manager, and sales manager, respectively.

The appointments of **I. D. Davidson,** C.B.E., to the Boards of the Shell Petroleum Co. Ltd and N. V. de Bataafsche Petroleum Mij has now been confirmed, with effect from 1 July 1957.

G. H. Herridge, who recently succeeded Sir Stephen Gibson, C.B.E., as managing director of the Iraq, Basrah, and Mosul Petroleum Companies, has now been elected managing director of five associated companies: Qatar Petroleum Co. Ltd, Petroleum Concessions Ltd, Petroleum Development (Trucial Coast) Ltd, Petroleum Development (Oman) Ltd, and Syria Petroleum Co. Ltd. **H. W. Fisher,** executive director, with the title of "joint managing director" of the Iraq, Basrah, and Mosul Petroleum Companies, has also been elected to the Boards of the five associated companies in the same capacity.

S. C. Price, F.C.S., A.R.I.C., A.F.Inst. Pet., who has been with Monsanto Chemicals Ltd as technical sales assistant in connexion with oil additives since 1950, has now joined Jet-Lube Ltd as general sales manager. Mr Price is well known to many members of the Institute in connexion with the London Branch, of which he has been a committee member for three years and a very energetic honorary secretary for the last two years. His office is at 26-32 Caxton Street, London, S.W.1.

Group Capt. John A. Kent, D.F.C. and Bar, A.F.C., A.F.R.Ae.S., M.I.Ae.S., has been appointed sales manager, Kelvin and Hughes (Aviation) Ltd. This is a new post in the Company. During the Battle of Britain he fought with No. 303 Polish Squadron and No. 92 Squadron—claimed to be the top scoring fighter squadron throughout the second world war. He retired from the R.A.F. in November 1956, after 21 years of adventurous and distinguished service.

A. W. Hardie, hitherto general manager of Scottish Oils and Shell-Mex Ltd, has been appointed managing director of that Company. **C. M. Vignoles,** C.B.E., M.Inst.Pet., continues as chairman.

A. Muir, M.I.Mech.E., A.S.M.A., has been appointed manager for the Scottish and Northern Ireland Region, Tecalemit Ltd. He joined the Company in 1935, and was an industrial sales representative until 1942 for Scotland and Northern Ireland. He subsequently became manager of the Marine Department, and later Railways Division at the Head Office in London. He has visited Venezuela, Colombia, Sweden, and much of Africa, on behalf of the Company. Since 1955 he has been responsible for the sales of the Company's products to the nationalized industries—railways, coal mines, etc.

Sir Nevil Macready, Bt, has been appointed manager of Supply Department, Mobil Oil Co. Ltd. Since the beginning of this year this Department has been managed by J. A. Paul, a director of the Company.

In 1951, Sir Nevil joined Powell Duffryn Ltd and spent some time in France. At that time, Powell Duffryn held a half-interest in Mobil Oil Company and the following year Sir Nevil transferred to Mobil. In 1953, he became assistant to the manager of Distribution Department and in 1955 assistant to the manager of Supply Department. When F. R. Squires, manager of Distribution Department, went to the U.S.A. for four months earlier this year, Sir Nevil was appointed acting manager in his absence.

Peter Kennaby, who joined Mobil Oil Company in May 1955, has succeeded **F. E. Cowley** in the Company's Advertising Department. Mr Cowley joined Mobil in 1911 in the Industrial Sales Department and early in 1915 moved to the Glasgow Office where he stayed for nearly three years. During 1917-8, he served with the Royal Naval Air Service, but rejoined Mobil in 1919, again in the Industrial Sales Department.

In 1924 he transferred to the Advertising Department and for seventeen years edited and produced Mobil's monthly staff training magazine, *Marketing Bulletin*. After the last war he recreated Mobil's Advertising Department and specialized until his retirement in press, outdoor advertising, and film work.

NEW SHELL APPOINTMENTS

The Shell Petroleum Co. Ltd have announced the appointments of **J. B. Scott** as manager, Finance Administration; **C. S. Hadfield** as controller; **F. S. McFadzean** as treasurer; and **B. E. Blakely** as deputy treasurer.

The appointment has also been announced of **J. G. van den Bosch** as finance manager and a director of Shell Tankers Ltd.

IRICON APPOINTMENTS

Samuel K. McCauley, The Atlantic Refining Co., has been elected president of Iricon Agency Ltd, succeeding **John W. Gendron,** Tidewater Oil Co.

Iricon represents the 5 per cent interest in the Iranian Oil Consortium held by American Independent Oil Co., Getty Oil Co., Hancock Oil Co., Richfield Oil Corpn, San Jacinto Petroleum Corpn, Signal Oil & Gas Co., and The Standard Oil Co. (Ohio) as well as Tidewater and Atlantic.

Other newly elected officers include: **A. H. Elliot** of Iricon's London office, executive vice-president; **David E. Day,** Richfield, and **R. S. Stewart,** Sohio, vice-presidents; **C. F. Krug,** Getty, treasurer; **Harley C. Stevens,** AIOC, assistant treasurer; **Harold A. Black,** Los Angeles, secretary and general counsel; **John K. Schemmer,** San Jacinto, assistant secretary.

Benjamin Tyran, AIOC, **B. H. Dresser,** Hancock, and **F. D. Lortscher,** Signal, were elected to the Board of Directors.

ASTM's NEW OFFICERS FOR 1957-8

The following new officers for 1957-8 were elected at the 60th Annual Meeting of the American Society for Testing Materials:—

Richard T. Kropf (vice-president and director of Research, Belding Heminway Company Inc.), as president (term: one year).

F. L. LaQue (vice-president, International Nickel Company Inc.), as vice-president (term: two years). In 1949, he was the recipient of the F. N. Speller Award in Corrosion Engineering of the National Association of Corrosion Engineers, of which he is a past-president.

The following have been elected directors of ASTM for a term of three years:—

Claude L. Clark (metallurgical engineer in special steel developments, Timken Roller Bearing Company).

Arthur E. Juve (director of Technical Service Research, B. F. Goodrich Research Center, Brecksville, Ohio).

John H. Koenig (director, School of Ceramics and the New Jersey Ceramic Research Station, Rutgers University).

Rudolph E. Peterson (manager, Mechanics Department, Pittsburgh Research Laboratories, Westinghouse Electric Corpn).

Russel W. Seniff (manager, Research, Baltimore & Ohio Railroad Company).

BP Reception to Nigerian Constitutional Conference

The Chairman and directors of British Petroleum gave a reception at Grosvenor House on 7 June, in honour of the delegates to the Nigerian Constitutional Conference. A large number of Nigerian residents in London were also invited.

After the guests had been received by N. A. Gass, the première showing of a new BP film, *Three Roads to Tomorrow*, was held. It tells the story of the journeys of three Nigerian students between their homes and Ibadan University. The three young men live far apart in the three regions of the country, and the film shows, in colour, what Nigeria is like to-day and the help which oil power is giving to its development. It was made in Nigeria by Greenpark Productions Limited.

In the accompanying photographs Mr Gass is seen greeting (*left*) the Hon. Alhaji Ahmadu, C.B.E., M.H.A. (Sarduana of Sokoto, Premier of Northern Region of Nigeria), and (*right*) the Hon. Chief Obafemi Awolowo, M.H.A. (Premier, Western Region of Nigeria).

BP photographs

Notes of the Month

British Petroleum Price Reductions

From 3 July wholesale prices of various petroleum products in the United Kingdom were reduced as follows:

Aviation spirit, wide cut gasoline, motor spirit, and white spirit, ½d per gallon.

Derv fuel, gas oil, and fuel oils, ¾d per gallon.

Aviation turbine fuel, burning oil, and vaporizing oil, 1d per gallon.

Withdrawal of IP Method 38

In accordance with a decision of the Standardization Committee, IP Method 38/55 Existent Gum-Motor Fuel, is to be withdrawn. This method will, therefore, not appear in the 17th Edition of *Standard Methods for Testing Petroleum and Its Products.*

Test Well in Sicily

Drilling of a new deep test well by BP's exploration subsidiary in Sicily has begun near Caltagirone.

Drilling of this well, known as Troitta No. 1, follows intensive geological and geophysical surveys of the Company's licence areas in South-East Sicily.

BP Marketing Starts in Canada

More than fifty service stations in the Saguenay–Lake St. John region of Quebec changed their identity in May, as the green and yellow BP shield appeared on stations formerly operated by the Lake St. John Distributing Company. BP (Canada) Ltd purchased this company in March, thereby making its first merchandising move in Canada. The service stations are in major towns of the area and on highways linking them.

Kwinana Expansion

Preliminary work has begun at BP's Kwinana refinery, Western Australia, on the storage tank expansion programme which will considerably increase the plant's storage capacity. Nearly 3000 tons of steel plate will be required for the new tanks and delivery of the first 1000 tons started recently.

The new tankage forms the initial phase of the £A3,500,000 expansion scheme, which also includes the erection of a catalytic reforming plant of the latest design. This reforming unit, of which the design has been completed, will not only upgrade low octane motor spirit but will also enable the refinery to blend a greater number of products.

Ownership of BP Stock

In a leaflet issued to its employees, the BP group have quoted some facts and figures from the Annual Report and Accounts for 1956. Of particular interest is the fact that BP's £101 million Ordinary Stock is held by the British Government (56 per cent), The Burmah Oil Co. (26 per cent), and the remainder (about £18 million) by some 27,000 different investors. These latter are predominantly small stockholders, since about 80 per cent of individual holdings are of £5000 or less and about 55 per cent of £200 or less.

In the House of Commons, on 1 July, the Economic Secretary to the Treasury said that the amount originally paid by the Government for their holding in the British Petroleum Co. was £5,001,000, and that the value of the Government holding at the close of business on 28 June was just under £462 million.

Irish Refining Company Formed

G. Noble, chairman of the Working Committee connected with the development of the proposed oil refinery at Whitegate in County Cork, Ireland, announced recently that a new company had been formed to develop the project.

The new company is to be known as the Irish Refining Co. Ltd, and its first meeting was due to be held in Dublin about the middle of July, when a full statement outlining plans for the construction of the refinery was expected.

It is anticipated that the Lummus Company, who have been appointed the main contractors for the new refinery, will be commencing work on the site during this month.

Petroleum Chemicals in Germany

The British Petroleum Company's German associate (BP Benzin-und Petroleum–G.m.b.H.) and Farbenfabriken Bayer, of Leverkusen, announce that they intend to form a joint company for the manufacture of petroleum chemical products. They will each have a 50 per cent participation in this company, the name and address of which will be announced in due course.

The site of the production units, of which the first is already being built, is adjacent to the Bayer plant at Dormagen, near Cologne. The plant envisages investment costs of about DM 240 million (£20 million) over a period.

About 300,000 tons a year of petroleum feedstock will be required for the plant's cracking units and will be supplied from a new BP refinery to be built in the Ruhr area.

The plant will produce organic semi-finished products.

Shell to Resume Persian Gulf Operations

An order for the construction of a mobile drilling platform for marine drilling in the open sea off Qatar, in the Persian Gulf, has been placed in The Hague by N.V. de Bataafsche Petroleum Mij.

The platform, which will replace the one wrecked off Qatar six months ago, will be built by N.V. Werf Gusto, of Schiedam.

It should be ready by the end of 1958, when it will be towed out to the Persian Gulf. There, it will be used in the concession area of the Shell Company of Qatar to continue the search for oil below the sea-bed. On completion of these operations, the outfit will become available to Group companies engaged on exploration work in other parts of the world.

The original mobile platform, which had already been used to drill two wells off Qatar, was damaged beyond repair during a sudden gale on the night of 27 December 1956.

Silvachemicals may Rival Petroleum Chemicals

Silvachemicals, or chemicals derived from wood, may soon rival those of the petroleum chemical field, according to statements made by W. G. Meyer and J. G. Coma

in their presentation before the National Meeting of the American Institute of Chemical Engineers, held recently in Seattle. One ton of pulp processed for paper produced sixty pounds of a versatile chemical—dimethyl sulphide—explained these engineers.

It is stated that this was just a wedge in the silvachemical field, which was destined to be compared with that of petroleum chemicals, now one of the fastest growing industries in the United States. Wood pulp cooking liquors from Kraft processes were being used at Crown Zellerbach's Camas mill for the production of dimethyl sulphide, and which showed promise as a sulphur carrier in agricultural and rubber chemicals.

This process was now in the final stages of development and would eventually produce tank car quantities for chemical intermediates and other uses under consideration.

Natural Gas Vital to Pacific North-West Economy

The use of natural gas will have an appreciable effect upon the future growth and development of the Pacific North-West, stated Carl A. Trexel, Jr, at the American Institute of Chemical Engineers' recent meeting in Seattle. He considered that probably the greatest single effect of natural gas upon this region would be the equalization of the industrial energy rates between the North-West and California.

The Pacific North-West had long been deficient, he explained, in this form of natural energy, which had been enjoyed by other sections of the United States for many years. Availability of natural gas would now place the North-West in the same advantageous position as the other regions with respect to those industries usually requiring this form of energy. Flat glass manufacture, ceramics, chemicals, food processing, and metal heat treating were industries most likely to benefit. They now might consider the Pacific North-West as a logical region for their expansion.

Bronze Age Sword found at Wandsworth

A leaf-shaped Late Bronze Age sword (*ca* 1000–450 B.C.) was found last October by L. Parkinson Hill, while inspecting the work on the construction of the new jetty at Mobil Oil Company's Wandsworth works. The Assistant Keeper, London Museum, writes "... Leaf-shaped swords are the earliest true swords (as distinct from rapiers) found in Britain... This specimen is a good example of a well-known variety of sword generally held to be comparatively late in the history of the type. The milling round the outer edge of the hilt is, however, an unusual and distinctive feature. Its purpose was to key into position the plates of horn or wood originally riveted to the hilt ..."

Oil Found in another Nigerian Well

The third well, Afam No. 3, drilled near Afam, 20 miles east of Port Harcourt, has encountered oil.

It is located three-quarters of a mile south of Afam No. 1, which discovered oil at the end of last year. Afam No. 2, however, which was completed some three months ago, was a dry hole.

On the encouragement provided by the results of the two successful wells, Shell–B.P. now plan to continue drilling further wells until it has established the size of this potential oilfield. The drilling outfit is now being moved to a site about two miles west of the discovery well.

Since it will be necessary to put the successful wells on test production, the Company has also decided to go ahead with its plans to construct a small 6-inch dia pipeline from Afam to Port Harcourt, through which the oil produced by the tests can be evacuated. This pipeline is expected to be completed before the end of this year.

The oil produced on test will be exported to European refineries, using the same temporary installation which has been constructed in Port Harcourt to handle the test production from the Oloibiri Oilfield, 65 miles west of Port Harcourt.

Thames Sailing Barge Match

Members of the crew of the sailing barge Sirdar *enjoy a well-earned drink aboard the* Royal Sovereign *after winning the Champion Bowsprit Class of the Thames Sailing Barge Match on 19 June. This annual race was originated in* 1863 *and takes place over a 50-mile course from Lower Hope Reach to North Oaze Buoy and back to Gravesend. The London and Rochester Trading Co. Ltd, who are the owners of* Sirdar, *were presented with a cup awarded to the winner by Mobil Oil Co. Ltd*

Drilling Barge Outfit for Nigeria

A drilling barge with a landing deck for helicopters which, together with all auxiliary floating craft and equipment, involves a total expenditure of nearly £1,300,000, has been ordered by Shell–B.P. Petroleum Development Company of Nigeria Ltd.

The equipment is due to arrive in Port Harcourt, in the Eastern Region of Nigeria, in October next. It will be used in operations in the tidal swamps along the Niger Delta

coast and its first exploration drilling location is expected to be in the New Calabar river estuary near Krakrama, in Degema Division, approximately 20 miles south of Port Harcourt. This will be the first application in Nigeria of this type of drilling outfit, which has already proved so successful on Lake Maracaibo, Venezuela.

Before drilling an exploration well, a pile-driven foundation will be prepared to support the drilling derrick and some of the machinery. The bulk of the drilling outfit is permanently installed on the barge, which will be moored close to the derrick foundation. This particular barge will be used in combination with a National 80-B outfit, capable of drilling to 12,000 feet.

The barge, which will be built to Lloyd's rules and requirements for vessels of its class, will have a displacement of about 3000 tons. The flat-bottomed steel hull will be 158 feet long, 80 feet wide, and 10 feet deep, and will be divided by longitudinal and transverse bulkheads with separate compartments for water ballast, crude and fuel oil, and with additional storage space for fresh water and fluid mud.

The pump room below the main deck will accommodate three slush pumps, two mud transfer, two ballast, two bilge, and one crude oil pump. The main power and auxiliary equipment, the crew's quarters, and the stores will be at main deck level, with the engineers' quarters and the radio room on the upper deck.

Other auxiliary equipment ordered includes a 500-h.p. tug, three barges (one, a utility; one, a test unit; and the other, a mud plant), a 5-ton and a 12-ton crane, a 30-ton floating crane, several fast launches for maintaining supplies, and houseboats for staff and labour.

SMBP Tanker Programme

Speaking at a luncheon following the opening of the new Dublin graving dock* by the President of Ireland, C. M. Vignoles, C.B.E., managing director, Shell-Mex and B.P. Ltd and director of Irish Shell Ltd, said that some £300 million was to be spent annually on tankers outside the United States, for the next four or five years. He continued:

"To illustrate what this means to individual owners, Shell Tankers have spent £100 million on vessels in four years; BP have just announced a £80 million building programme, while Eagle have a £35 million programme.

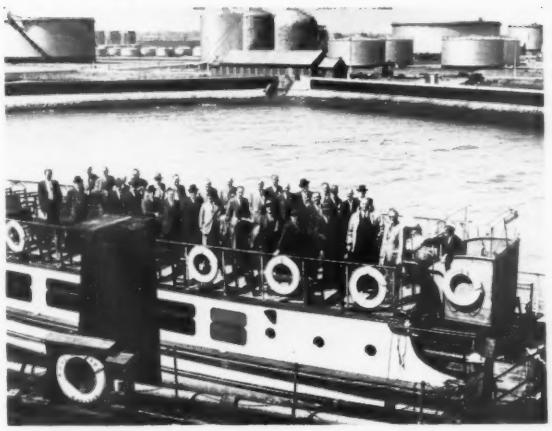
"My group have several 65,000-ton tankers on their building programme, and one of the factors which has led to the choice of this size is that it provides a compromise between the vessel which can be used regularly and economically through the Suez Canal, and the out and out Cape route.

"To-day there are tankers under construction of a size that were hardly envisaged even two or three years ago. The bigger the tanker the cheaper to build in proportion to its carrying capacity, although so far as the oil industry is concerned the cost of providing installations to accommodate these monsters is immense.

"When I tell you that last year our tankers carried about 160 million tons of crude oil and petroleum products, and steamed 65 million miles upon routes girdling the globe, you will realize just how hard tanker fleets are made to work."

* The first ship to enter the dock was the Shell tanker *Narica* (11,892-dw tons).

Shipowners' Visit to Coryton Refinery



Aboard the M.V. Zodiak *are nearly fifty members of a party of Mobil Oil Company's marine customers, who recently visited Coryton refinery. The party were shown the new catalytic reforming unit, which came "on stream" in May, and the new deep water jetty which is capable of accommodating* 33,000*-ton tankers.*

Airborne Survey in India

Based on the delineation of possible oil supporting rock structures, the results of the first major airborne search for oil in India are reported as "extremely encouraging".

This was disclosed in the completed report which was handed over to the Indian Government early this month by the Acting Canadian High Commissioner to India, J. M. Teakles, and Dr W. B. Agocs, chief geophysicist for the project carried out by Spartan-Canadian Aero, the Canadian air survey group of Ottawa.

The survey, which was paid for jointly by Canada and India under the Colombo Plan assistance programme to underdeveloped countries, was the first natural resources survey to be completed to the report stage. It included the planning, flying, compilation of geophysical data, and the interpretation of the data for the Indian Government.

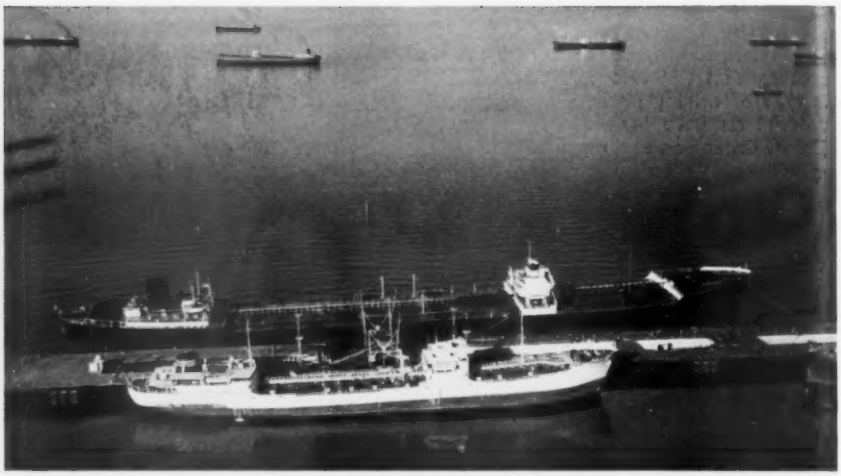
The survey covered two areas: some 17,000 square miles in Rajasthan in the northwest, adjacent to Pakistan, and a 90,000 square mile area of the Indo-Gangetic plains in the northeast, extending from the Ganges River to the foothills of the Himalayas.

The purpose of the survey, suggested by the Indian Government, was to gather geological knowledge of certain regions in India and to determine more particularly, if possible, whether the type of rock structures usually associated with oil-bearing lands existed.

Summing up the report, Dr Agocs said, "the results are extremely encouraging, calling for more air and ground exploration."

"While this does not mean we can now say there is oil there," according to Dr Agocs, "the information obtained is of great value as a guide for the gravity and seismic exploration which usually precedes an actual drilling programme."

The purpose behind the survey, as behind the Colombo Plan which sponsors it, is to increase the economic self-sufficiency of underdeveloped areas and, in that way, to raise the standard of living of the people.



The Universe Commander *on her maiden voyage loaded* 80,982 *tons of crude oil in* 19¼ *hours at Mina al Ahmadi. Incidentally, the average rate of* 4207 *tons an hour was not a record. The number of vessels laying at anchor awaiting loading berths indicates the need for the extra facilities referred to below. A few days later the* Universe Leader *was loaded—two giants within a week.*

Expansion of Oil-Loading Facilities at Mina al Ahmadi

A further step towards expanding tanker-loading facilities at Mina al Ahmadi in Kuwait is being taken by Kuwait Oil Company. When completed, this latest extension will materially increase the loading capacity of this port which, even now, is the world's largest loading terminal.

The main features of the expansion programme are the launching of additional submarine lines and the addition of a big-inch gravity line connecting the main crude tank farm at Ahmadi to the loading terminal.

The facilities at Mina al Ahmadi at the present time consist of an oil pier with eight loading berths and five sea berths, the latter consisting of two submarine lines to each berth. The principal feature of the present expansion programme is the launching of four additional submarine pipelines to form two new submarine berths. The first two of these submarine pipelines were launched on 11 May. One of these is a 24-inch diameter line 7300 ft in length which will be used for exporting fuel oil resulting from the new topping units at present under construction; the other line, 12-inch in diameter, will be used for exporting marine diesel oil. The second new berth will consist of a 24-inch crude line with a loading capacity of aproximately 2000 tons per hour and a 12-inch diameter fuel oil line. These latter two lines are now being launched. On land, a ninth gravity line, 32-inches in diameter, is now under construction.

The two projects referred to above will increase the crude loading capacity of Mina al Ahmadi to approximately 1,500,000 barrels a day. The facilities will also provide for the loading of fuel oils as bunkers or as cargo and one submarine berth will be reserved for white products.

The 24*-inch line passing through the guide on the foreshore.*

Technical Details

The launching of the first 24-inch line in May involved something new in such operations. It was necessary to carry the line out into the water on a gradual 25° bend for a distance of 1250 ft to a gap in a reef. From there it went straight out to the berthing point. Normally submarine lines are hauled straight off the shore in the direction in which they are to be laid.

It is believed that this is the first time that a submarine pipeline has been laid with such a curve in it. To keep it deviating from the track alignment an extra throat was constructed on the foreshore to guide the line on its curved path. Steering the line through the gap in the reef also needed delicate handling. Two dolphins were constructed to guide and position the line, the northern one acting as a guide and thrust block. Because of strong currents, five launches were continually nosing the line, which was floating on the usual A frames, to keep it on its course.

Another feature of submarine launching as practised by Kuwait Oil Company is the insertion of a smaller line (in this case a 12-inch line) inside the larger one to ease the stresses when the line is allowed to sink to sea-bed. The

12-inch line is subsequently recovered and pulled as a bunker line to the same berth as the larger line.

The whole operation of launching these lines is carried out by Kuwait Oil Company's Constructional Division of Engineering Department and the Marine Department.

Background Information

These expanded facilities, which will supplement the existing five sea berths and eight berths at the oil pier, are but the latest stage in a continuing programme of developing oil exporting facilities since the first shipments of oil from Kuwait were made in June 1946. The biggest item in this programme was the construction of the oil pier, one of the major projects of engineering carried out in Kuwait. It is an all-welded steel structure built in a "T" formation. The approach roadway stretches 4140 ft eastward to the open sea. The northern extension of the "T" head, 2805 ft long and 105 ft wide, carries six loading berths. The shorter extension to the south, 1077 ft long and 100 ft wide, has two berths. The minimum depth of the water at the loading

Towing the 24-inch line.

berths is 40-49 ft, which permits the largest modern tankers to come alongside.

The approach to the loading jetty, carrying a roadway 24 ft wide and a 35 ft wide pipeway carrying eight 24-inch and one 30-inch crude oil lines, a 16-inch line for fuel oil for ships' bunkers, and a 12-inch line for diesel fuel, connects the jetty with the shore. Smaller lines supply fresh water, sea water for fire-fighting services, and compressed air.

The largest oil tankers afloat can be handled at this jetty and high loading rates have been achieved, as for example, the loading of 27,739 tons of crude oil in 6¼ hours.

When the oil pier at Mina al Ahmadi was brought into service in 1949 it might have been regarded as ahead of its time, for the largest tankers then afloat were about 30,000 dw tons. The foresight that was shown in the oil port's construction has been abundantly justified, however, as tanker size has progressively increased, the largest tankers in service, for example, the 56,000-dw ton *Sinclair Petrolore* and the 84,000-dw ton *Universe Leader* having loaded cargoes at this pier.

The curve needed to bring the 24-inch line to the gap in the reef is seen above, while below the operations on shore are illustrated.

*Practical Applications of Bitumen in the Oil Industry**

By K. A. WHEELDON†

Petroleum bitumen, obtained as the end product of the primary distillation of asphaltic crude oil, or from the further blowing with air of soft bitumen, is available in various grades covering a wide range of properties, which make it suitable for a variety of purposes.

Although for some of the uses of bitumen in the petroleum industry, straight run or blown grades are required without further processing, for the majority further processing is necessary. This is either to obtain special properties by the blending of fillers, asbestos fibres, waxes, etc., or to convert the material into a form suitable for application without having to heat it. The basic grades have to be melted before they can be applied, and this is often inconvenient or impracticable. It is, therefore, normal practice to process bitumens either by emulsification in water or, alternatively, by dissolving in a volatile solvent. There is an additional advantage that in such further processing certain properties can be imparted which cannot be obtained in any other way. This particularly applies in the case of emulsions.

The three main fields where bitumen is used in an oil refinery are for thermal insulation, for buildings, and for road making and tank foundations.

Thermal Insulation

Most refinery processes are heat processes, but some, including de-waxing, SO_2, and lighter hydrocarbon handling, involve low temperatures. Both types of plant, and their ancillary services, must be thermally insulated to maintain their efficiency. Such insulation must, in addition, be given mechanical protection and kept dry, either from the weather or from water vapour. Bitumen materials are ideal for these purposes and for erecting, or fixing, some of the insulants used.

Hot Insulation

Bitumen adhesives are not often used for fixing hot insulation, as the high temperature would affect the bond. The insulation, often in slab form, is generally fixed mechanically, by means of clips, bands, or wires. Slabs do not present a smooth uniform surface, and so a layer of plastic composition is applied, generally with wire-netting as reinforcement. This hardsetting composition is not suitable as an exposed finish, and on external work must have additional mechanical and weathering protection. Although this gives the smooth level surface required for subsequent treatment, it does not generally provide a satisfactory base for waterproof treatment. It is too loosely bound and dusty, and this is overcome either by mixing into the composition a quantity of bitumen emulsion up to 50 per cent by volume or by priming it after drying with a thin solution. The first is the better method, as it gives an ideal surface and also provides a stronger layer with quite good water resistance.

The bitumen coating for subsequent application to hot insulation has to be:—

(1) Waterproof, to keep the insulation dry;
(2) Permeable to water vapour, so that the insulation may "breathe", and so that the initial water content can dry out without disrupting the coating;
(3) Tough and heat resisting, to protect the warm insulation from mechanical damage;
(4) Rubbery, to take up the expansion and contraction of the plant.

All these requirements can be met with suitable bitumen emulsions and such a protective coating would normally be applied in one or two coats to give a bitumen finish approximately $\frac{1}{8}$ inch thick.

There has recently been a trend towards the use of metal cladding over hot insulation on larger vessels and pipelines. Whilst easy to fix on long straight sections, this is an expensive alternative to bitumen coatings, which are easy to apply to curved surfaces and easy to repair.

Cold Insulation

For insulation on cold plants, the requirements needed of bitumen materials are both wider and different. The applications involved in the petroleum industry are:—

(1) As adhesives;
(2) Vapour sealing;
(3) Weather protection of outside insulation.

The second and third are often combined.

Adhesives are used for fixing slabs or preformed sections to vessels, tanks, pipelines, etc., and bitumen materials of the solid (hot application), emulsion, and cutback (or solvent) types are all suitable under certain conditions. The solid materials, basically blown bitumens of fairly low softening point, are applied by dipping the slab or section of insulation into a shallow bath of the heated material and quickly offering up the insulation to the surface to which it has to be stuck before it cools. The cold materials are applied by brush or trowel, either to the insulation or to the other surface before offering up.

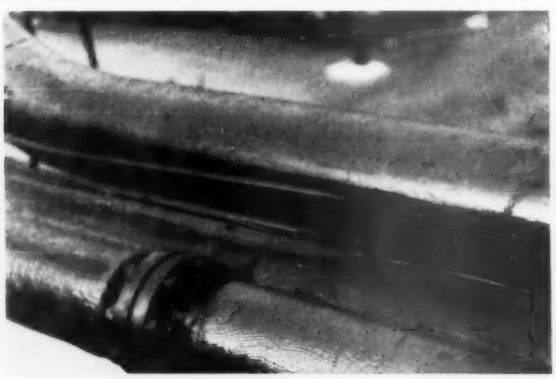
The use of bitumen materials for vapour sealing needs explanation. The insulation of cold spaces or surfaces is complicated by the tendency for water vapour to move towards the cold from the surrounding warmer atmosphere.

*Paper read to IP South-Eastern Branch on 2 October 1956.

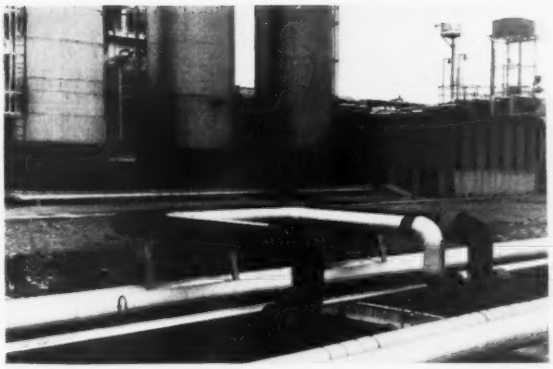
†Berry Wiggins & Co Ltd.

The reason is that the water vapour always present in the atmosphere exerts a vapour pressure according to the quantity present and the atmospheric temperature. At a given temperature, only a certain amount of water vapour can be contained before condensation takes place. The lower the temperature the less the quantity of vapour and the lower the vapour pressure. Hence, when a low-temperature pipeline or vessel is insulated, the water vapour pressure in the voids of the insulation immediately adjacent to the cold surface will be lower than that of the surrounding atmosphere, and vapour will accordingly pass through the insulation from the atmosphere to this cold face. Unfortunately, it is not possible to avoid this by the use of dense solid materials for the insulation as such materials are almost invariably good conductors of heat. As the amount of vapour that can be contained at the cold face is less than on the outside, or "hot" side, of the insulation, condensation will probably occur and build up with subsequent freezing if the temperature is below 32° F. It is, therefore, essential to take steps to prevent water vapour passing through the insulation, and this is done by the application of a vapour barrier on the hot or atmospheric side of the insulation. The life of cold insulation is, in fact, limited to the efficiency of the hot side vapour seal.

Bitumen, in its basic form one of the most impermeable of all organic materials, is ideal for this purpose. Certain processed bitumens, such as emulsions of the clay type, are not suitable as permeability is affected by the method of processing. Certain special emulsions, on the other hand, retain the exceptionally low permeability of the basic bitumen and are preferred for a number of reasons, including absence of smell and ease of application, to cutback materials which are also generally suitable. It is generally considered that a transmission rate of 0·05 gr/sq.ft/hr is the maximum permissible for operating temperatures down to −10° C. This limit can easily be met by a uniform dried coating of an appropriate grade of approximately $\frac{1}{8}$ inch thickness. Nevertheless, there is still the risk of some water vapour accumulation in the insulation, as the vapour sealing material is not absolutely impermeable, nor will its application be perfect. Even with a perfectly-applied vapour seal which will permit the diffusion of 0·05 gr/sq.ft/hr on a low temperature plant, and a water vapour pressure differential between atmospheric and cold phases of as low as 8 mm Hg, the amount of water vapour passing through will amount to over 6 gallons a year per 1000 sq.ft of insulation. Even so it is still possible,



Insulation on pipelines protected with bitumen emulsion/hessian treatment.



High-pressure steam main, the insulation on which is protected with a bitumen coating—note the use of aluminium cladding on insulated oil lines.

by adoption of a special system now available in Britain, to ensure permanently that any such water vapour passing into the insulation does no harm. De-humidified and refrigerated air is circulated, at a temperature slightly below that of the cold surface, through a series of air ducts formed in the insulation. The rate of circulation is such that the air can pick up all the water vapour as it penetrates the insulation, and subsequently deposit it on a colder surface outside.

In many applications, the actual vapour seal has also to act as weather protection. In addition, therefore, to being effectively impermeable to water vapour, this coating has to possess resistance to heat, cold, and mechanical damage. This formidable list of requirements is easily met by some specially processed bitumen products, many of which also contain rubber.

Buildings

The uses of bitumen in the buildings on an oil refinery site are so numerous that it is only possible to do little more than list them here. They cover four main purposes, *i.e.*:—

Damp-proofing and waterproofing;
Adhesives;
Mastic and plastic compounds;
Paints and protective coatings.

There are also, however, some miscellaneous but nevertheless interesting applications.

Damp-proofing and Waterproofing

Cement and plaster mixes can effectively be rendered waterproof by the addition of a small proportion of bitumen emulsion in the first instance.

The best-known application of waterproof cement mixes is for a waterproof, flexible, and resilient flooring material. The basic mix is similar to a granolithic concrete mix with added bitumen emulsion.

Work is at present proceeding on additions of bitumen emulsion to cementitious building blocks to obtain products of better quality and more resistant to moisture.

In the case of plaster, the emulsion is added to the original plaster/water mix. A rather higher proportion of emulsion is used—up to 25 per cent by weight of the plaster—and the bituminized mix is then used to prepare precast waterproof building blocks or panels. Due to the special chemical

nature of building plasters, it is necessary to use a specially prepared emulsion, otherwise the rate of set, water content, hardness, etc., of the mix can all be affected. A further use of this type of emulsion is in the production of a waterproof plaster board. Here it is used in the plaster core of the board and treated paper linings are used to prevent deterioration of the latter when exposed to the weather.

A further use of bitumen emulsions in conjunction with cementitious mixes is the addition of a bitumen emulsion to a cement vermiculite mix for roof screeds. The purpose of the emulsion is not so much to reduce water absorption of the vermiculite during the initial mixing process, as to allow the screed to dry out during the short period of exposure to the weather before final roofing is applied, without absorbing more water during periods of rain, etc.

Roofing and Dampcourses

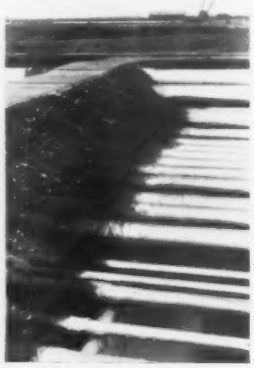
Bitumen roofing felt and dampcourses are generally built up upon a base of hessian, saturated felt fibre, or other material.

Bitumen is also applied as a jointless coating applied hot, in emulsion, or solution form applied cold, for the waterproofing of all types of roof. The latter are particularly suitable for waterproofing flat roofs or monolithic concrete construction, two or three coats at rates between 4 and 8 square yards per gallon being used. They are also widely used, with suitable reinforcing membranes, for waterproofing roofs of precast beam construction.

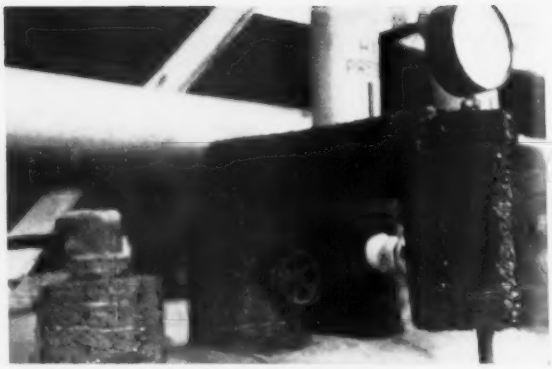
In addition to new roofs, bitumen emulsions and solutions are also widely used for repairs to old flat roofs of felt, asphalt, zinc, lead, copper, etc., when these are no longer satisfactory and need additional protection. Although films of bitumen emulsion are susceptible to washing off by rain before they are set, they are, nevertheless, particularly easy to apply, and the films given by them have particularly good durability and weathering properties.

Floors

Preformed strip material as used for dampcourses is not suitable for an overall dampcourse in solid direct-to-earth floor construction. This is provided by either cold emulsion, or alternatively as a hot pour, to give a film up to $\frac{1}{8}$ inch thick, generally as a sandwich layer membrane between two layers of concrete.



Insulated lines with an external covering of metal cladding given additional bitumen protection when passing through an earth fire bank.



Preformed cork sectional insulation erected in hot bitumen adhesive on cold pipelines.

Adhesives

One of the basic physical properties of bitumen materials is their inherent adhesiveness. The uses of bitumen as an adhesive in building construction are many.

Wood blocks of $\frac{5}{8}$ inch minimum finished thickness are stuck direct to concrete using either a cold applied bitumen emulsion, or alternatively a solid bitumen compound which has to be heated. The solid compound is generally of the straight run type of bitumen of medium-hard penetration and sets immediately on cooling. The emulsions set more slowly and generally contain rubber latex.

Asphalt Tiles. Adhesives used for asphalt tiles are solvent-containing materials, rather than emulsions, with low-boiling solvents for rapid set.

Lino Tiles. An emulsion adhesive containing rubber is considered to be the most suitable for laying lino tiles on to cement screeds.

Cork Tiles. In the case of cork tiles, a solvent-containing cold applied adhesive is preferred to an emulsion due to the susceptibility of cork to swell from moisture.

Roofing. Bitumen adhesives are almost universally used for fixing bitumen roofing felts to concrete, asphalt, and other surfaces except wood boards, and for cementing two or more layers of felt together. A hot applied bitumen of the oxidized type (similar to that used for surfacing the felt itself) is the most widely used.

Alternatively, a cold solvent type adhesive, again based on the same bitumen, can be used.

Gritting of Felt. Built-up felt roofing and sometimes asphalt is often finished with a blinding of grit, chippings, or white spa, to provide a walking surface and to reflect the sun's rays—it is usual to use a bitumen adhesive for fixing this grit, either hot or cold applied.

Fixing of Tiles. Alternatively, asbestos, asbestos cement, or other proprietary tiles may be used as a surface finish on such roofs and these also are generally stuck down with bitumen, although for these a soft oxidized type of bitumen is generally used for hot application.

Mastics and Plastic Compounds

There is a wide use of cold applied bitumen plastic compounds both in new construction and in maintenance work. Various types of compound are used and among the properties that have to be met are varying degrees of plasticity

and set, resistance to flow in hot weather, minimum shrinkage, and resistance to absorption into porous surfaces. Certain bitumen based mastics can meet all these requirements. A new and more technical use is in the adoption of curtain walling types of building construction, where a permanent weatherproof and draughtproof seal is required between the individual components making up the wall area.

Glazing Compounds and Putties

Bitumen plastic-type compounds can be made in ideal forms for use as glazing compounds or putties. Glazing compounds can be made to harden to any desired degree, or alternatively to remain permanently plastic, and owing to their excellent weathering properties and good adhesion to glass they have an excellent long-lasting performance. Their use, however, is chiefly confined to industrial premises due to the difficulty of painting over bitumen surfaces without the risk of bleeding through or crazing.

Whilst dealing with glazing, a novel use of bitumen occurs in glass/concrete construction. When glass lenses are set in concrete, cracks can develop between the lens and the concrete, particularly with large lenses as are sometimes used in decorative roofs, and a prior coating of a thick emulsion film on the glass before placing the concrete takes up the slight expansion/contraction effects and provides a permanent waterproof seal. A similar principle is employed in erecting glass ashlars in sand and cement on large areas of wall. A coating of bitumen emulsion applied to the back ribbed surface of the ashlar 24 hours before erecting in sand and cement in the normal manner will allow the ashlars to expand and contract due to temperature changes, without fracture of the bond.

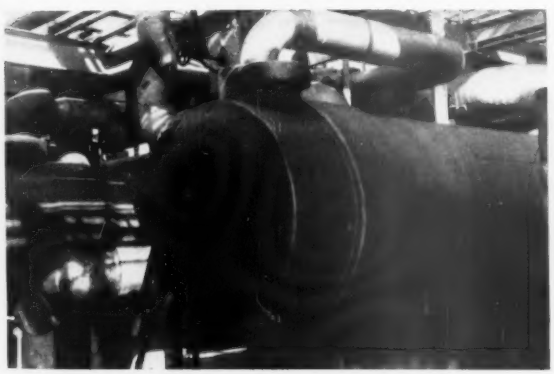
Bitumen Paints

Apart from the more visual uses of bitumen paints in building, bitumen paints are used for innumerable protective applications on components eventually hidden from sight, *e.g.*, steel conduit, door cramps, water pipes, etc. The method of application is generally by dipping.

The paints generally used are simple solutions of bitumen in volatile solvent, but where superior weathering properties and particularly gloss retention are required, a bitumen/drying oil solvent type paint is recommended.

Apart from protective purposes, bitumen paints are widely used for priming purposes in building construction,

Curved end of a cold heat exchanger, cork insulated and covered with emulsified bitumen coating.



Cement/bitumen flooring, ½-inch thick, being given final trowelling after laying over bitumen emulsion priming coat. Base is concrete.

particularly on concrete and other porous surfaces, to give a non-absorbent, dust-free finish prior to using other bitumen materials such as flooring adhesives, laying roofing felt, etc. The priming paints used are similar to the simple solution type, except that they are made to thinner viscosity to assist in penetrating or soaking into the surface to which they are applied. They often contain small proportions of special chemicals to ensure adhesion where dampness is present.

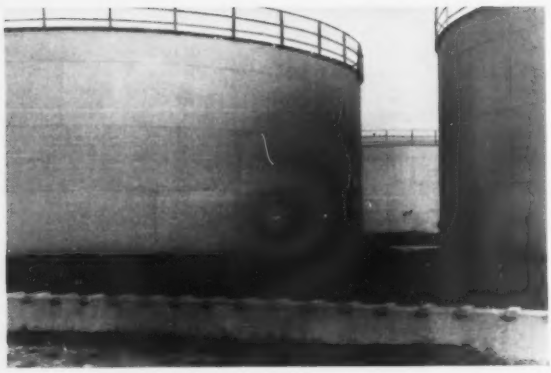
Further uses of bitumen paints in concrete construction are:—

(1) The use of a very thick paint, solution, or emulsion over a layer of base concrete or, at construction joints, to prevent adhesion of subsequently laid concrete material adjacent.
(2) The occasional use of a thinner solution as a surface coating to precast concrete work for burial in the ground, to reduce the risk of sulphate attack on the cement.

The above refers to only some of the uses of bitumen in building construction and maintenance.

Roads

It is almost impossible to construct a network of roads in a refinery without resorting to bitumen materials in some form. Even if concrete is adopted for road construction, bitumen materials are still used in the expansion joints, which are generally sealed with a hot poured bitumen rubber compound. It is more probable, however, on account of cost and speed of laying, that the roads will be built-up with two or more layers of bitumen macadam, to provide a "flexible" road. Such construction would always comprise a prepared foundation of stabilized soil, hardcore, or graded stone, over which would be laid a basecourse of 2-inch or 1½-inch graded crushed stone coated with a bitumen binder. After a short period for compaction and settlement, this would be followed by a wearing or surfacing layer or course of ¾-inch or ½-inch graded aggregate similarly coated with bitumen. The process of coating the stone with bitumen is normally carried out at the quarry where the stone is obtained. This stone is won by blasting and then the rock is crushed and the fragments separated by screening, whence it is collected in separate bins each containing a definite size of stone. The stone is often wet or damp and is passed through a heater to dry it off.



Oil storage tanks mounted on bitumen fine aggregate mix overlying the main tank foundation.

The warm or hot crushed stone of appropriate size and grading is charged into a twin paddle mixer and the bitumen binder, which will be either a soft straight run bitumen or a very thick "cutback" binder prepared from it, with up to 15 per cent of kerosine and or creosote flux, is run in. The whole mix takes 2-3 minutes only and the material is then discharged into hoppers or lorries for transport to the road site. The proportion of binder is generally between 7 gallons/ton for a base course or up to 12 gallons/ton for smaller size wearing courses. These materials can be spread and rolled either warm or cool according to the nature of the binder used.

For maintenance, the most likely treatment will be surface dressing. This comprises the application by hot spraying of a thin layer of cutback binder on to the existing road surface and blinding this with small crushed rock or gravel chippings. Alternatively, a similar process can be carried out cold using a bitumen road emulsion specially prepared for the purpose.

Tank Foundations

A hot bitumen mix of the same type as a bitumen macadam, although with a different aggregate, is frequently used to provide a solid waterproof bed on to which oil storage tanks are to be erected. The structural foundation for the tank of concrete, or consolidated earth, or hard filling, etc. is first prepared and the bitumen mix is then spread hot to an approximate depth of 2–3 inches. The tank is then constructed on top. The aggregate used for the mix is generally sand or quarry fines, and the bitumen binder either a soft naturally occurring bitumen, *e.g.* as found in the Middle East, or, in Britain, a bitumen cutback binder similar to that used for macadam but containing an additional amount of volatile flux. The texture and consistency of this resultant mix is such that the weight of the completed tank compacts and squeezes it into a tight mass entirely filling the space between the foundation and the tank bottom, to eliminate the risk of water accumulating at this point and corroding the tank plates.

Steelwork Protection

Although much refinery steelwork is encased in concrete or other fire-proofing material, the problems of corrosion of external steelwork when not so protected afford yet further scope for bitumen, even though the finish normally obtained is black. Some mention was made earlier of paint, and this is widely used on tanks, but for long-term protective purposes on steelwork a more substantial coating is required. The protection that can be given by bitumen coatings is due to their good resistance to most acids and alkalis, and their low permeability to water vapour. Bitumen itself, however, is not actively "rust inhibitive" and a suitable primer such as red lead should be applied and allowed to dry out before the protective coating is built up. The first essential of this is that it should be of adequate thickness, and because of its low basic cost a substantial layer $\frac{1}{16}$–$\frac{1}{8}$ inch in thickness can be economically built up. The types of material used are generally emulsions of the clay type, perhaps incorporating rubber to increase the toughness and resistance to mechanical damage.

It should, perhaps, be mentioned that the films given by some, although not all, bitumen materials have good fire resistance. They will not drip or flow even at very high temperatures and a Classification Type II Surface of Low Flame Spread has been achieved with certain types of processed material.

Acknowledgments

The author is indebted to Berry Wiggins & Co Ltd, for the time and material for the preparation of this paper and to R. P. Bell for his helpful comments. He would also like to thank The British Petroleum Co Ltd, Bruce Martyn Ltd, and Berry Wiggins & Co Ltd for permission to use photographs.

NEW ORDERS FOR BP TANKER COMPANY

The BP Tanker Company has since publication of its last building programme placed orders for 26 new tankers, totalling about 1,150,000 dw tons. This was announced by J. H. Jackson, director and general manager of the Company, at the launch of the 32,000-dw ton *British Trader* at the Clydebank Yard of John Brown and Co. Ltd on 26 June.

The launching ceremony was performed by Mrs Gillespie, wife of R. Gillespie, C.B.E., a managing director of The British Petroleum Co. Ltd.

The programme includes seven ships of 65,000 dw tons and nine of 50,000 dw tons. All the twenty-six ships are to be built in British shipyards for delivery between 1960-3. At present building prices the cost of this programme exceeds £80 million. The orders comprise: —

		dw tons
John Brown & Co. Ltd	Clydebank	2 of 65,000 1 of 50,000
Cammell Laird & Co. Ltd	Birkenhead	2 of 65,000
Fairfield Shipbuilding & Engineering Co. Ltd	Govan, Glasgow	1 of 65,000 1 of 50,000
Wm. Hamilton & Co. Ltd	Port Glasgow	1 of 15,500
Harland & Wolff Ltd	Belfast	3 of 50,000 3 of 15,500
	Govan, Glasgow	1 of 15,500
Hawthorn Leslie & Co. Ltd	Hebburn-on-Tyne	2 of 34,500
Lithgows Ltd	Port Glasgow	1 of 34,500
Alexander Stephen & Sons Ltd	Govan, Glasgow	1 of 50,000
Swan Hunter & Wigham Richardson Ltd	Wallsend-on-Tyne	2 of 65,000
J. L. Thompson & Sons Ltd	Sunderland	2 of 34,500 (may be increased to 50,000)
Vickers-Armstrongs Ltd	Barrow-in-Furness	3 of 50,000

Books and Films

Oil Shale Bibliography

Published by the technical division of the Tulsa (Oklahoma) public library, *Petroleum Bibliography No.* 38 is an extremely valuable and comprehensive reference book on literature and patents on oil shale and shale oil. It covers the period 1913-55 and includes references to over 200 patent specifications throughout the world and to over 900 articles on the subject.

This bibliography occupies 65 quarto pages and has been printed through the courtesy of the Carter Oil Company. It should prove an extremely useful combination to anyone wishing to take up the study of the production of oil from shale in any way.

Impulse

In the introduction to this new quarterly, published by Mitchell Engineering Ltd in conjunction with Journal Press, it is stated that "there is opportunity for a magazine directed to illustrating the real achievements as well as the problems of our day. To trace the pattern of life emerging from their background will form a chief purpose of *Impulse*."

The forty-four pages of issue No. 1, dated May 1957, give an indication as to how these objects are to be attained. There are articles dealing with the design and constructions of the Chapelcross nuclear power station, on the use and limitations of computers, on sociology, on science and art, on machine age and artists, on the education of student engineers, on the use of fly ash, and so on.

Price of this well-illustrated and well-produced magazine is 10s 6d post free and it can be ordered from Journal Press, 5 & 6 Clement's Inn, London, W.C.2.

Risalat al-Naft

Recently the Kuwait Oil Company has commenced a new house magazine for its native staff in Kuwait. Entitled *Risalat al-Naft* (Message in Oil) it is indeed a handsome production. It is attractively produced, well-illustrated, and the cover is printed in colour. So great was the demand for the first issue that it was not possible to send copies to the U.K. in any quantity. However, copies of the second issue have been circulated and a translation of the list of contents shows how wide is the scope of this magazine. For example its contents vary from an article on "Oil, the Servant of Man" to a short illustrated feature on "Clothing for Mothers-to-be". Between these features the reader can learn something about the wisdom of fasting, an account of the IP symposium recently held at Ahmadi, and will find details of world petroleum production, and so forth. There is also a centre page spread of colour pictures illustrating life in Kuwait and it should perform an extremely useful public relations and employee relations function in the Middle East.

Atoms for Peace

This Soviet documentary film, with an English commentary, is a survey of Russian achievements in the field of the peaceful uses of atomic energy. It opens with a definition of atomic energy with the aid of animated diagrams, and shows how an atomic reactor works. Then follow details of the many types of atomic reactor in use in the Soviet Union; the production of radioactive isotopes; protection from gamma rays by means of remote control equipment and mechanical manipulators ("fingers"); how a cyclotron works; the work of the Institute of Nuclear Problems; the multi-channel gamma spectrometer, and the study of pi-mesons; the 36,000-ton proton-synchrotron; and an atomic-powered ice breaker.

The next section is devoted to industrial and agricultural uses of atomic energy. The items of particular interest to the petroleum industry are (a) the treatment of polyethylene and (b) the application of radioactivity in oil prospecting. The former shows how a polyethylene bottle stopper may be radioactively treated to withstand certain liquids etc., and the latter how radioactive methods are employed in borehole exploration.

The final, and somewhat lengthy, section is devoted to the work of the Oncological Research Institute. This includes cases of tumours, cancers, and angioma treated with radioactive cobalt, and the use of radioactive iodine in the determination of thyroidal complaints.

This 35-mm film, in colour, runs for 75 minutes, and is available on hire (details on request) from Plato Films Ltd, 18 Greek Street, London, W.1. A 16-mm black and white version is also available (hire fee £2 10s).

Approaching the Speed of Sound

This film, in colour, is the first of a series of three films, with the general title of "High Speed Flight", and is an extension of the older six-film series "How an Aeroplane Flies".

Made by the Shell Film Unit, *Approaching the Speed of Sound* is designed as an aid in training airline pilots who transfer to jets, as background information for other members of airline staffs, as a training film for air forces and cadets, and to be of interest to all air-minded people. In these respects it will undoubtedly prove a great success.

It describes how sound travels through air; why the speed of sound affects high-speed aircraft; the significance of Mach number; and various design features. Many flying and wind tunnel shots are used, together with a number of animated diagrams. Perhaps the most outstanding feature of the film is the effects of air flow over wing sections and aircraft models in a wind tunnel. These are shown by colour schlieren photography, a technique which makes air density gradients visible to the camera. In a black and white form, schlieren photography has been used for many years, and the name derives from the German schliere, meaning a streak or striation in a piece of glass which causes a change in the refractive property. The possibility of obtaining colour effects was realized and the technique was evolved at the National Physical Laboratory during recent years. The Shell Film Unit has developed the method with 35-mm film equipment.

The film runs for 28 minutes and is available on loan from the usual Shell distributing agencies. A 16-mm version is also available.

Airlift Operations in Papua

Assembling one of the helicopters at Badili near Port Moresby. These helicopters are air lifting piece by piece, drilling rigs and all essential equipment into the heart of the Papuan Jungle.

Preparations for drilling the Komewu well (now at a depth of some 3000 feet) were considerably speeded up by the use of helicopters. In the difficult terrain of Papua, where BP is searching for oil in association with Australian and American interests, one of the worst obstacles to such exploration is the gaining of access to drilling sites.

The Komewu site is eighty miles from the coast and some eight and a half miles beyond the limit of navigation of the Aworra River. The building of a road across this intervening stretch of jungle and swamp would have proved most difficult and costly and would have taken many months to complete, but in five weeks helicopters landed on the site a complete drilling outfit (capable of reaching 10,000 feet), earth-moving equipment, building materials, and sufficient supplies to begin drilling.

The three helicopters—Sikorsky S58's—are capable of lifting loads of approximately 4000 lb, either internally or externally, with sufficient fuel for 100 miles flying, and with seating capacity for 13 passengers. For the shorter haul from the Aworra River they were equipped to lift somewhat heavier loads. It was, of course, necessary to redesign the drilling outfit itself in such a way that all components could be broken down to just under two tons.

Two new Sites

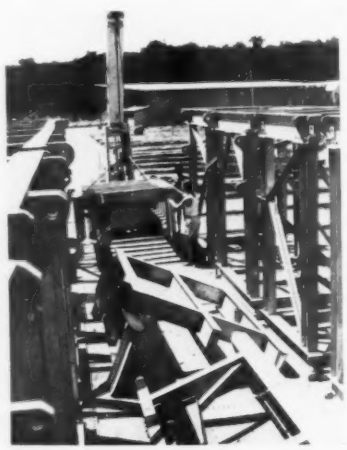
Helicopters are now being used to prepare a second drilling site at Komewu and another at Sireru, some 18 miles to the east.

Flying-in of cargoes is continuous since several trips are made between the river base and the rig site without the helicopter landing. The procedure is for equipment and supplies to be assembled on cargo slings or nets in suitable loads at a loading depot; the helicopter with an attachment device on the undercarriage hovers over a load and is directed into position by a ground marshal who at the appropriate moment attaches the cargo sling; the helicopter rises and the load is lifted, flown to the rig site, and deposited by a release lever exactly where required and without the helicopter touching ground; the machine then returns for a further load.

As an indication of what can be accomplished, one helicopter flew 33 tons of cargo into Komewu in 10½ hours flying time.

Helicopter leaving the "helibase" at Victory Junction with a load of timber for the rig site at Sireru. The vane on the load is necessary to stabilize it as the load tends to swing and thus makes the helicopter difficult to fly.

BP photographs



Drilling rig equipment being laid out at Victory Junction prior to its air lift by helicopter to the rig site at Sireru.

Conferences, Courses, and Symposia

SYMPOSIUM ON MICROCHEMISTRY, 1958

A symposium on microchemistry will be held in the University of Birmingham over the period 20–27 August 1958, both dates inclusive. This Symposium will be held under the auspices of the Society for Analytical Chemistry and is being organized by the Midlands Section and Microchemistry Group.

It will consist of original papers and recent advances in microchemical techniques, presented by a number of chemists of international repute. The subjects will include:—

Inorganic and Organic Qualitative and Quantitative Analysis	Radio Chemistry
Absorptiometry	Chemical Microscopy
Chromatography	Thermogravimetric Analysis
Polarography	Biochemical Methods
Emission Spectrography	Industrial Applications
	Teaching, etc.

An exhibition of new and special apparatus will be held simultaneously, and visits to local places of interest will be organized.

A Ladies' Committee has been formed to organize entertainment for non-scientific visitors.

Registration forms and further information may be obtained on application to the Symposium Secretary: W. T. Elwell, F.R.I.C., I.C.I. (Metals Division) Ltd, P.O. Box 216, Research Department, Kynock Works, Witton, Birmingham 6. Envelopes should be marked "Symposium".

CONFERENCE ON MOLECULAR SPECTROSCOPY

The Spectroscopic Panel of the Hydrocarbon Research Group of the Institute of Petroleum is organizing a Conference on Molecular Spectroscopy to he held at the Institution of Electrical Engineers in London on 27 and 28 February 1958. This is the second Conference to be arranged by the Panel and, as in the previous one held in October 1954, the programme will cover the whole field of spectroscopy, the emphasis being on the newer techniques and the more recent developments in instrumentation. The main topics to be discussed will be Nuclear Magnetic Resonance, Technical Developments, and Intermolecular Forces and Factors Affecting Intensities of Absorption Bands. In addition, there will be an open discussion on the organization of spectroscopic services in an industrial laboratory.

The papers contributed will be by invitation only and will be preprinted for circulation prior to the meeting. Application forms for membership of the Conference, together with further information, can be obtained from: E. Thornton, Secretary, IP Spectroscopic Panel, c/o The British Petroleum Co Ltd, Chertsey Road, Sunbury-on-Thames, Middlesex.

It is hoped to arrange for modern British Spectrometric equipment to be on exhibition during the Conference.

SPECIAL COURSES FOR MANAGEMENT

The Department of Management Studies of The Polytechnic, Regent Street, London, W.1., is offering several special day-time courses on subjects of importance to management. The term begins on 23 September. Further information and enrolment forms can be obtained from The Registrar, St. Katharine's House, 194 Albany Street, London, N.W.1. (Telephone: EUSton 6763), where the Department is housed. The courses are as follows:—

The European Common Market. Management is showing a lively interest in this momentous development. The course begines on 24 September. There will be eight weekly meetings, each lasting from 2.0-50 p.m.

The Sources of Economic Information. This course begins on 10 October. There are twelve weekly meetings, each lasting from 2.0-5.0 p.m.

Restrictive Trade Practices. This course begins on 5 November. There are ten weekly meetings, each lasting from 2.0-5.0 p.m.

Effective Speaking. This course begins on 23 September. There are ten weekly meetings, each meeting lasting from 2.0-5.0 p.m.

Report Writing. This course begins on 27 September. There are twelve weekly meetings, each lasting from 9.30 a.m. to 12.30 p.m.

Interviewing Techniques of Management. This course begins on 7 November. There are thirteen weekly meetings, each lasting from 2.0-5.0 p.m.

Chairmanship and Committee Procedure. This course begins on 2 December. There are ten weekly meetings, each lasting from 2.0-5.0 p.m.

New Developments in Marketing

A series of five evening lectures for directors and senior executives will be held at The Polytechnic, 309 Regent Street, London, W.1., on consecutive Thursdays starting 26 September.

The following chairmen will preside over the meetings which will be addressed by well-known specialists and will in each case be followed by a discussion: John Ryan (vice-chairman, The Metal Box Company); John Rodgers, M.P. (director, J. Walter Thompson Ltd); Alan Sainsbury (chairman, J. Sainsbury Ltd); Professor M. G. Kendall (Professor of Statistics, London University); and H. W. Morris (commercial manager, British Nylon Spinners).

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THE BRITISH NATIONAL COMMITTEE FOR NON-DESTRUCTIVE TESTING

This Committee has been formed to act in all technical matters relating to non-destructive testing. In its terms of reference it is stated that the Committee shall not be allowed to absorb or replace the activities of an existing Institution or Society, but by agreement might appropriately supplement such activities.

Objects

(a) To promote discussion.
(b) To assist a co-operating Institution or Society in the presentation of a paper or a group of papers concerned with non-destructive testing.
(c) To undertake those duties with respect to international matters which properly devolve on the National Committee, which may include the nomination of delegates to represent the United Kingdom at international meetings, and the initiation of proposals or questions for discussion at those meetings.
(d) To collect and administer funds for the purpose of carrying out the above objects.

Constitution

Members of the British National Committee will be drawn from three sources:—

(i) Representatives of constituent Institutions and Societies of the Joint Committee on Materials and Their Testing.
(ii) Representatives of other Institutions and Societies interested in non-destructive testing.
(iii) Individual experts co-opted by the National Committee.

Further details may be obtained from the Secretary, Joint Committee on Materials and their Testing, The Institution of Mechnical Engineers, 1 Birdcage Walk, Westminster, London, S.W.1.

Petroleum in Parliament

Discharge Facilities for Tankers

In a written reply on 4 June, the Minister of Transport and Civil Aviation said that he had held discussions with the interests concerned with Milford Haven, who were seeking powers to provide facilities for ships up to 100,000 deadweight tons. At Southampton plans were going forward to enable tankers up to 65,000 deadweight tons to be handled. On the Clyde, a new jetty was to be provided capable of accommodating ships up to 100,000 deadweight tons. On the Mersey, a new oil berth was contemplated capable of taking ships up to 65,000 deadweight tons, or up to 100,000 deadweight tons with a draught restriction. On the Thames, the Port of London Authority and the oil companies were discussing the dredging necessary to raise the present limit of 45,000 deadweight tons. A number of other sites were also being surveyed by the interests concerned.

Asked, on 5 June, to make a further statement on the steps being taken to improve the facilities in U.K. ports by widening and deepening the entrances for this purpose, the Minister said that this matter was the direct responsibility of the port authorities. Many important deepening and widening works were at present being undertaken or were planned, including, in particular, works in the Mersey, the Clyde, and at Sunderland and Southampton.

Shell-B.P. Exploration in Nigeria

On 27 June, the Under-Secretary of State for the Colonies said that conditions of employment and trade union rights in Nigeria were regulated by the laws of that country. The only condition of this kind in the licences granted to the Shell-B.P. Development Company of Nigeria Ltd was that the Company must comply with any instructions given by the Chief Inspector of Mines for securing the health and safety of workers. He also said that compensation would be paid to occupiers and owners for the use of their lands.

In reply to other questions, he said that twenty prospecting licences and one exploration licence had been given. The royalty on crude oil was 4s per ton on oil produced during the prospecting stage and would be increased to 12½ per cent *ad valorem* when commercial production commences. There was no training requirement in the Shell-B.P. licences but the Company had their own trade school in Nigeria and also gave scholarships for technical training in the U.K. and Nigeria to suitable Africans. Minimum wages and fair conditions of employment clauses, he said, were included in the pipeline contract. Finally, he said that Africans were being trained as tractor drivers and welders.

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LABOUR STATISTICS FOR THE U.K. PETROLEUM REFINING INDUSTRY

The following figures are taken from the March 1957 issue of the *Ministry of Labour Gazette* (cf. previous figures given in the *IP Review* (1956, **10**, 302)).

Figures in bold type are the averages for all the industries covered by the tables.

	Men (21 and over)	*Youths and Boys*	*Women (18 and over)*	*Girls*	*All Workers*
No. of wage-earners covered by remuneration statistics	18,801	733	1026	28	20,588
Average earnings in last pay-week in October, 1956 (shillings)	247/3 **237/11**	108/8 **102/4**	131/6 **123/2**	**81/4**	236/4 **200/8**
Average number of hours worked in this pay-week ...	49·1 **48·5**	44·1 **44·9**	44·9 **41·5**	— **42·5**	48·7 **46·6**
Average hourly earnings in this pay-week (pence) ...	60·4 **58·9**	29·6 **27·3**	35·1 **35·6**	— **23·0**	58·2 **51·7**
			Males	*Females*	
Numbers employed (Jan. 1957)			33,100	7,200	40,300
Numbers unemployed (at 11 Feb. 1957)			238	33	271

Trade Literature, etc.

New Pressurized Fire Extinguisher

A new pressurized fire extinguisher of the vaporizing liquid type has been developed by The Pyrene Co. Ltd. A one-hand squeeze-grip release valve provides on-off control of the discharge of fire-fighting liquid—a quart of either "Pyrene" fire extinguisher liquid or chlorobromomethane.

The company's address is 9 Grosvenor Gardens, London, S.W.1.

Ultrasonics for Pipelines

Although ultrasonics have been used successfully for a number of years for the detection of flaws in steelwork, their use for the testing of welds on pipelines is a comparatively recent development in Britain. At the present time, MAPEL is operating an ultrasonic set on the 24-inch diameter line which is being laid between Romford and Shell Haven.

Details are available from Metal and Pipeline Endurance Ltd, Artillery Mansions, Victoria Street, London, S.W.1.

Flameproof Remote Control Stations

In petrol refining and storage depots, etc., it is frequently desirable to install contactor type motor starters in a non-hazardous position, but with the control point adjacent to the operator in the danger area. This condition has been met with a range of one-, two-, and three-button units, which have been approved by the Buxton Testing Station for use in all gases included under Groups I, II, and III, as set out in BS 229/1946.

Details are available from J. A. Crabtree & Co. Ltd, Lincoln Works, Walsall, Staffs.

Special Lubricants for Nuclear Power Stations

When initial schemes for atomic power stations were being considered several years ago, it was realized that among the important problems to be tackled would be the lubrication of plant subject to radiation.

To meet this requirement, Shell have produced a range of radiation-resistant lubricating and hydraulic oils and greases, under the brand name of Shell A.P.L. These products will be used in the operation of the first of the Central Electricity Authority's atomic power stations at Bradwell, Essex, which is being built by the Nuclear Power Plant Company.

Liquid Metal Pumps for Dounreay's Fast Reactor

The English Electric Company has supplied 48 electromagnetic pumps, of the flat linear induction type, for the Dounreay fast reactor. These pumps operate on the principle of the three-phase induction motor, and produce a pumping force wholly by electromagnetic means. They have no moving parts and no glands. At Dounreay, they will pump liquid metal in a useful heat extraction process.

Two complete prototype pumps were designed by the Company's Nelson Research Laboratories, and have been set up in a pumping rig at the Capenhurst Works of the United Kingdom Energy Authority, Research and Development Branch.

Equipment for Indian Oil Refinery

For the new Caltex oil refinery at Visakhapatnam, India, Foster Wheeler announce that they designed and engineered a crude oil distillation unit, a decarbonizing unit, a fluid catalytic cracking unit, and a gas recovery unit. The Company was also responsible for the engineering of a polymerization unit.

MV Change of Address

Metropolitan-Vickers Electrical Co. Ltd announces that the postal address of the Transformer Department is now as follows: Metropolitan-Vickers Electrical Co. Ltd, Transformer Department, Southmoor Road, Wythenshawe, Manchester 23.

For cables and telexes, the Department will continue to use the Trafford Park address: Metrovick Manchester Telex 66-314.

Scottish Distributors for Chamberlain

Chamberlain Industries Ltd announce that they have appointed Hailes Plant Sales & Hire Ltd, of 81 Great King Street, Edinburgh 3, and Royal Exchange Buildings, Glasgow, C.2, as their Scottish distributors and to handle the sales of both the well-known "Jenbach" diesel-driven air compressor and the "Staffa" range of mobile and shop cranes.

Hammond Floating Roof Tanks

A new 24-page catalogue describes in detail various types of floating roof tanks used for storing volatile or corrosive products. Construction features and functional advantages of each type are discussed and illustrated.

The catalogue (57 FR) is available on application to Hammond Iron Works, 744 Broad Street, Newark 2, N.J.

BP Aviation Service Aids Pioneer Flight

A BEA Viscount, the first British gas turbine aircraft to run a regular schedule to an Eastern European country, arrived back in London from the inaugural return trip to Belgrade on 2 June. All arrangements for fuelling, quality control, etc., carried out by the Jugoslav fuelling service, Jugopetrol, were made by the BP Aviation Service, while the fuelling vehicle itself was supplied by BPAS to Jugopetrol.

Oil Tanker Trim Indicator

An instrument which is claimed to obviate examination of the Plimsoll line to ensure even distribution when loading tankers, while the pipelines are flowing, is the Winston electronic servo device.

Details are available from Winston Electronics Ltd, Govett Avenue, Shepperton, Middlesex.

Cathodic Protection of Admiralty Tanker

Metal and Pipeline Endurance Limited have secured the order for the cathodic protection of five compartments used alternatively for oil and sea water ballast in the tanker *Wave Duke*, which is employed for white oils conveyance for Navy use.

This is the 71st ship for which the MAPEL exclusive system of finned magnesium anodes has been ordered. The Company's address is: Artillery Mansions, Victoria Street, London, S.W.1.

Unicube Motor Starter Boards

This brochure (No. 401) describes the Unicube range of medium voltage a.c. group-control starter boards, which have been designed primarily for heavy industrial service in oil refineries, etc. The manufacturers claim that, in addition to having an attractive, clean-cut appearance, Unicube assemblies permit extensions to be made with a minimum of disturbance. Copies are available from M. and C. Switchgear Ltd, Kelvinside Works, Kirkintilloch, Glasgow.

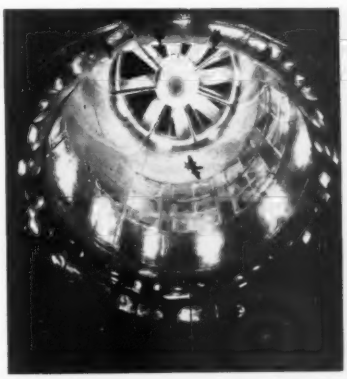
The Company has also issued a pamphlet (No. A3/2) which gives details of its standard products.

Wind Tunnels for Aircraft Research

In a special issue of *Whessoe Review*, there is a general description of three wind tunnels which have been supplied to the Royal Aircraft Establishment, Bedford. The three tunnels are (1) 3×3 ft transonic and supersonic tunnel; (2) vertical spinning tunnel; and (3) 8×8 ft high-speed tunnel for subsonic and supersonic speed ranges.

These tunnels, which have taken nine months to complete, make a notable contribution to Britain's research facilities.

Whessoe Review is published by Whessoe Ltd, Darlington.



Model aircraft being tested in the vertical spinning tunnel at the Royal Aircraft Establishment, Bedford.

Welding Fittings

B.K.L. Alloys Ltd has issued a leaflet, giving details of dimensions, weights, and specifications of the Company's enlarged range of elbows, tees, return bends, caps, and reducers for the petroleum and petroleum chemical industries. The fittings described are manufactured to American standard specifications and are available in carbon, stainless, and alloy steels, aluminium, and monel nickel.

A leaflet giving details of fittings manufactured to BS 1965, to match British pipe sizes, is also available on application to the Company at Birmingham Factory Centre, Kings Norton, Birmingham 30.

Hygrotherm System for New Synthetic Resin Plant

The contract for the heating and cooling system of the new synthetic resin plant at Styrene Co-Polymers Ltd has been awarded to Hygrotherm Engineering Ltd.

The heating and cooling plant will consist of a Hygrotherm heat generator with a ring main and loop circuit system. Pneumatically operated three-way valves will control the temperature at which the heat transfer medium is supplied to the reaction vessels of the resin plant. The heating medium will be Shell Voluta 45.

The Company claims that a feature of the heating and cooling systems will be the simplicity and precision of the temperature control which will be within $\pm$ 1°C.

The Company's address is 5 Fitzhardinge Street, London, W.1.

"Self-Sealing" Ring Gasket

Recently Cameron Iron Works Inc. has developed a new gasket for standard API flanges. Manufactured in sizes to replace API rings from 6 inches, 3000 lb, to 14 inches, 5000 lb, it is claimed that this new gasket reduces nipple-up time to a minimum and also provides considerably increased protection against leakage etc. It is also available in other sizes on special order and uses standard stud bolts and nuts.

In order that full advantage may be taken of this new equipment the Company has released the design to industry free of licence or royalty fees. Details are available from the Company at Time & Life Building, New Bond Street, London, W.1, or P.O. Box 1212, Houston, Texas, U.S.A.

Extreme Service Lubricants

Following research and field tests extending over many years, Jet-Lube Inc. have produced a range of lubricating greases and thread compounds which are adopted in many oilfields throughout the world. To an increasing extent these lubricants are also being adopted by general as well as heavy industry. The range includes oils, greases, grease compounds, and moly-disulphide (MoS_2) specialities, and are now being manufactured by an entirely British undertaking, Jet-Lube Ltd, at Wolverhampton.

The Company has isued two useful brochures, "Jet-Lube for Industry" and "Jet-Lube for Oilfields", which describe the properties and characteristics of these lubricants. Copies are available on request to Jet-Lube Ltd, 26-32 Caxton Street, Westminster, London, S.W.1.

Special Lubricant for Free Piston Engines

A special lubricant for free piston engines has been developed by Shell and is now available, where required, throughout the world. Tests leading to the development of this lubricant have taken six years and have been done in collaboration with Société Industrielle Générale de Mércanique Appliquée (SIGMA) of Lyons, France, and General Motors in the United States; it is already in use in almost all the gas generators built by SIGMA, with the exception of those operated by the French Navy.

Late in 1950, when SIGMA had begun small-scale production of GS 34 gasifiers, test bed runs at Lyons had revealed that cylinder and piston ring wear rates and cylinder and piston cleanliness were unsatisfactory—problems that were traced to the limitations of the heavy steam cylinder oil used for cylinder lubrication.

Various Shell lubricants were tested in the following years and these led to the development of Shell free piston engine oil.

Forthcoming Meetings

THE INSTITUTE

(At 26 Portland Place, London, W.1, 5.30 p.m.—tea 5 p.m.)

Some Developments in Marine Drilling Foundations.
A. Kranendonk — **4 September**

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MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

The *IP Review* and the *Journal* have recently been elected as members of the Audit Bureau of Circulations.

The Audit Bureau of Circulations is an impartial and independent organization comprising advertisers, advertising agents, and publishers. Its objects are to secure, by standard and uniform methods of audit, accurate circulation figures of publications.

Advertisers recognize the ABC Certificate to be of utmost importance in assessing, in conjunction with other factors, the value of a publication as an advertising medium. The Institute believes that advertisers and agencies should know the quality of circulation values they are buying. Hence it has always made known to advertisers and agencies the number of copies sent out by its despatching agency, and also, as accurately as possible, the number and variety of the positions held by the readers of its publications.

The above ABC monogram will now set the hall-mark of authenticity upon the circulation figures of the *IP Review* and the *Journal*.

(As a point of interest, there were, for June, 4779 *copies of* the IP Review *and* 4681 *copies of the* Journal).

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SITUATIONS VACANT

Readers may reply to IP Review *Box Numbers in the fullest confidence by following this procedure: Place the stamped envelope addressed to the advertiser in another envelope addressed to the Advertisement Manager of the* IP Review, *together with a note of names to which the reply should not be sent.*

ENGINEERING FIRM of repute in London desires to appoint **Technical Sales Representative.** Engineering qualifications desirable. Good knowledge of oil production and refining essential. Applicants should have previously established personal contacts with leading oil companies. Would also consider retired oil company employee. Exceptionally good prospects for person with initiative. Letters, treated in strict confidence, to Box No. 1115, c/o *The Institute of Petroleum Review*, 26 Portland Place, London, W.1.

RESEARCH SECTION HEAD

Required to take charge of research section of a petroleum laboratory, M.Sc., or Ph.D., with up to five years industrial or post-graduate academic research experience (not necessarily in petroleum).

Four-figure salary depending on qualifications and experience, with prospects of advancement beyond section head. The Company operates a non-contributory pension scheme and hostel accommodation is available for unmarried staff. Canteen and athletic facilities.

Fully detailed applications, which will be treated confidentially, should be addressed to Refinery Manager, Lobitos Oilfields Ltd, Ellesmere Port, Cheshire.

SHELL

The first commercial hydrodesulphurising unit applying the Shell Trickle Phase technique was commissioned at the Stanlow Refinery in April 1955. The performance of this unit has exceeded expectation.

The Spence Cobalt and Molybdenum Oxides on Alumina catalyst used was developed especially for its high selectivity, stability, and mechanical strength.

Shell Trickle Phase hydrodesulphurisation unit, Stanlow refinery. A Shell photograph.

SPENCE

5074

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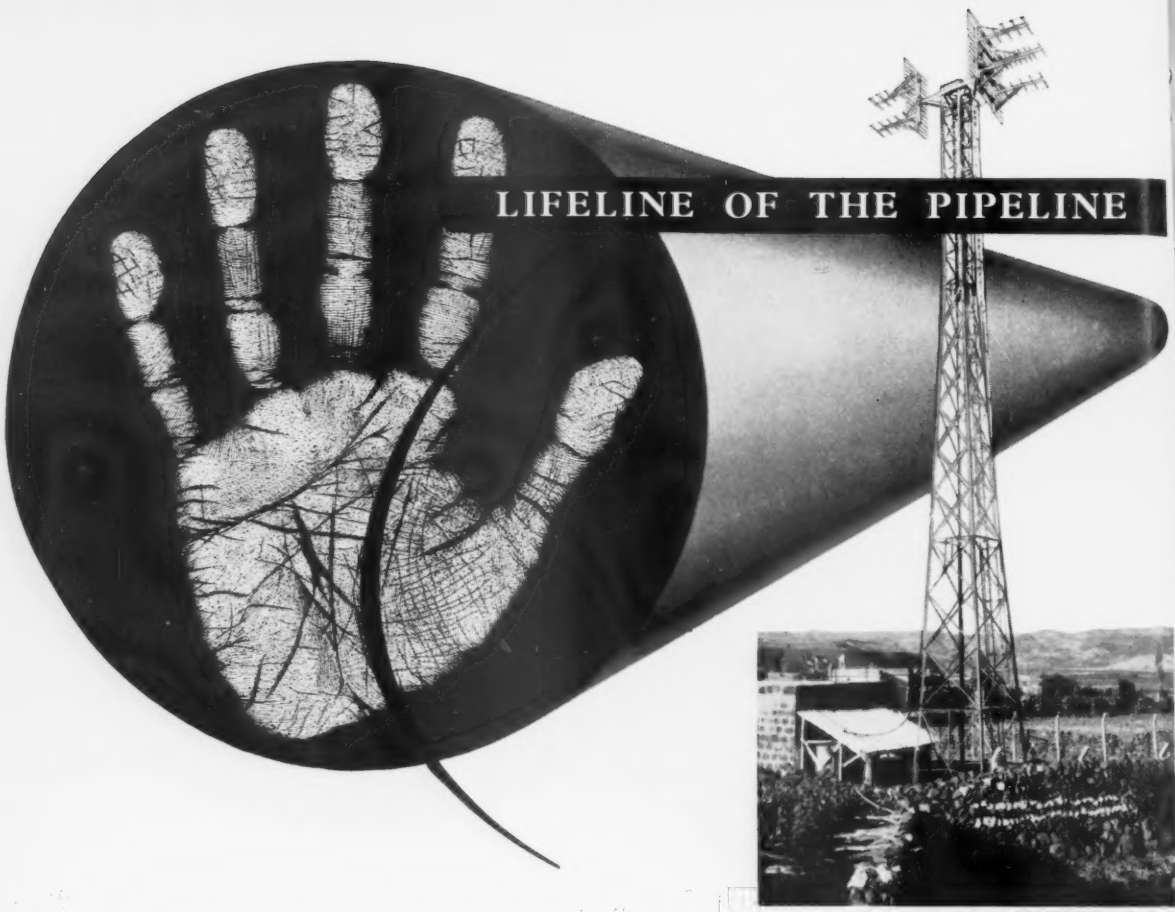


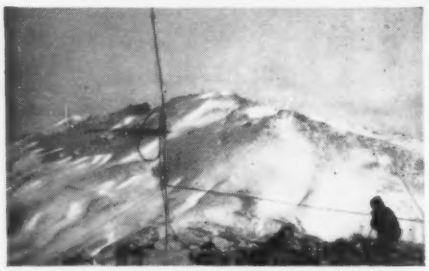
Marconi's hand in Communications for the Oil Industry

A repeater station installed at Dahr Safra for the Iraq Petroleum Company. Duplicated power supply and automatic changeover facilities ensure uninterrupted service in 4 channel VHF link stations of this type.

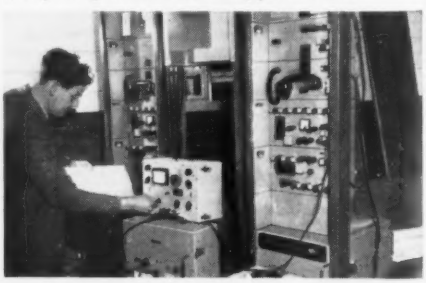
Reliable communications are the lifeline of a pipeline. Marconi VHF multi-channel systems are meeting all the requirements of oil companies for point-to-point networks. One system can handle all the traffic of telephone and teleprinter, tanker loading installations and mobile communications with vehicles and craft. Line systems can be linked with terminal equipment when required.

Both radio and power plant are designed for prolonged, fully automatic, unattended operation. Automatic fault alarms and change-over to duplicated systems provide warning of faults and uninterrupted service while they are being rectified.

VHF systems are as clear and reliable as landline or cable and they cost very much less to instal and maintain, particularly over difficult country.



A Marconi survey engineer tests for signal strengths at a lonely mountain site during the radio-propagation survey along the trans-Iranian pipeline route.



Development work at Chelmsford on HM 181 VHF multi-channel equipment. Eighty-four of these will be supplied for the trans-Iranian scheme.

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COMPLETE COMMUNICATION SYSTEMS

Surveyed, planned, installed, maintained

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LC 19

Juan Fangio, driving a Maserati, rounding Tobacco Corner at speed during the Monaco Grand Prix, which he won using BP Fuels and BP Energol Motor Oil.

BP SETS THE PACE

THE TRACK and the test-bed are BP proving grounds. On the roads and race-tracks of Europe BP fuels and lubricants are consistently proving their worth in all types of races ; to date this year seven major Formula One events and one International Rally have been won on BP products.

At the BP Laboratories at Sunbury research never ceases. Motor, aviation, gas turbine and marine fuels, burning oils, diesel oils and lubricants – all are constantly under test, to ensure best quality.

The final gains go to millions of users all over the world. The proved performance of BP products is theirs to enjoy wherever they see the BP sign.

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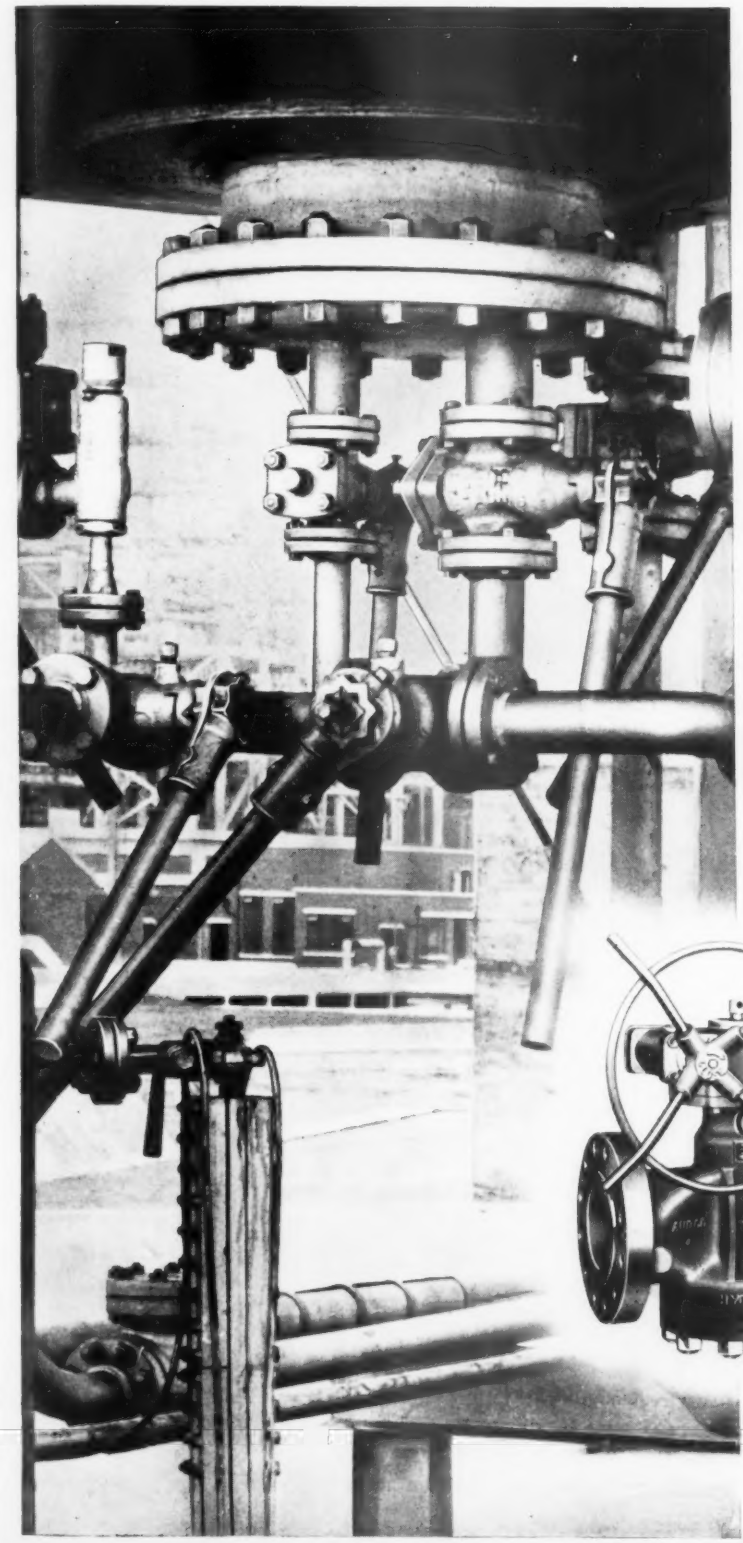

Start cutting your maintenance costs today by installing Audco lubricated plug valves . . . they cost no more than ordinary valves and cost less to maintain.

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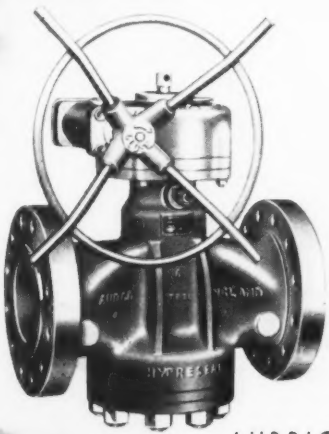

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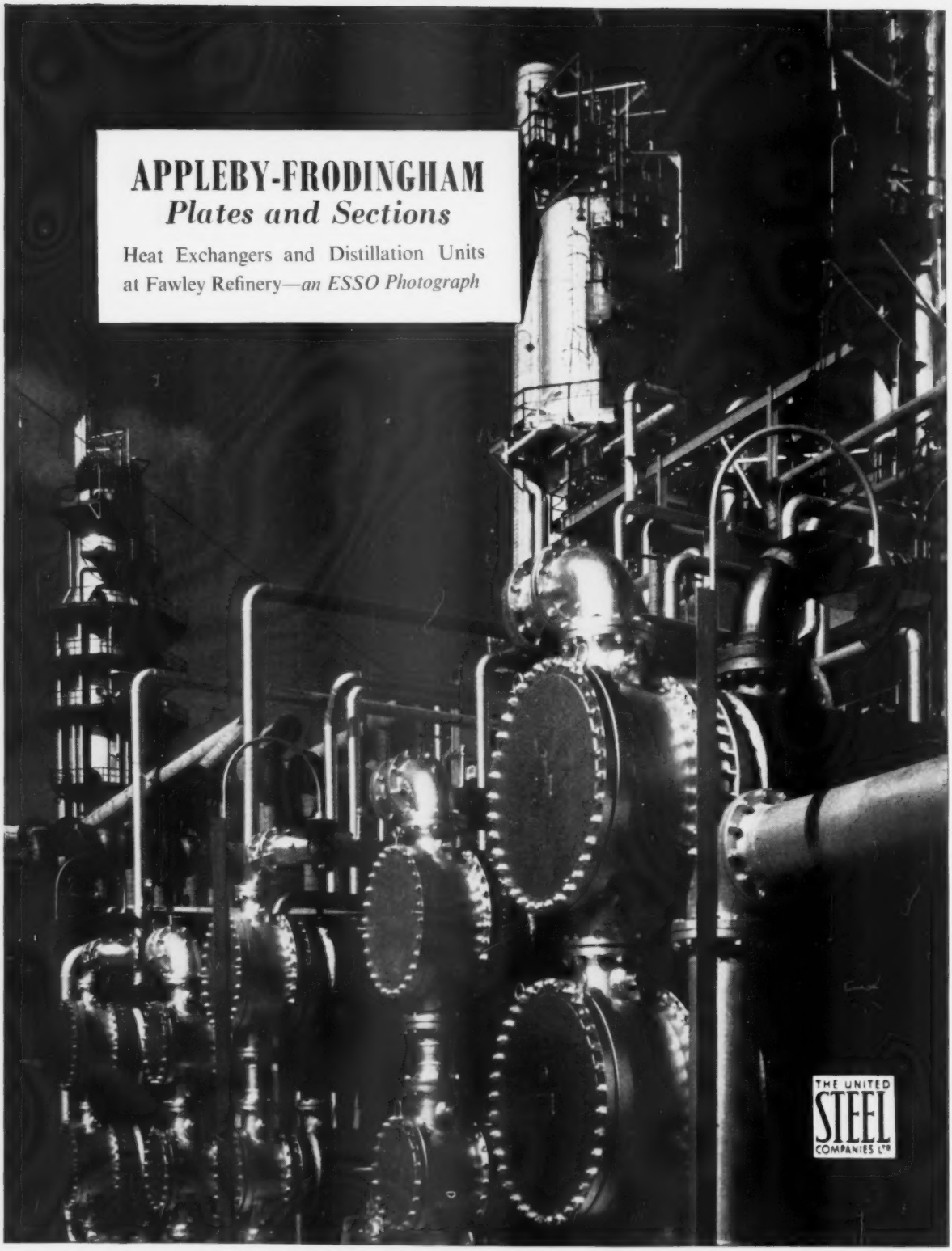

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for high flow and liquid level

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continuously adjustable
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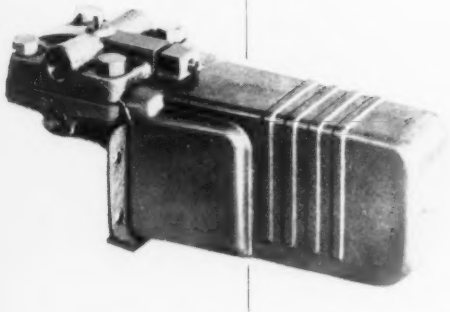

Two new *Differential Converters* offer:

High Range (1000 w.g.) Measurement

This new flow transmitter has a differential pressure range of 0-100 to 0-1000 ins. w.g. The high range converter is identical in construction to the standard model (range 0-20 to 0-200 ins. w.g.) except for a smaller diaphragm.

Liquid Level Measurement

The liquid level converter has a continuously adjustable range of 0-14 to 0-200 ins. w.g. The converter measures levels and specific gravities in closed tanks. To obtain minimum transmitter output (3 p.s.i.) at differentials greater than zero, the converter is equipped with a suppression adjustment: the pneumatic signal is directly proportional to differential pressure, or level. Receiving instruments are direct reading – no reversing relays are required.

'Standard' Advantages

All differential converters are highly responsive, accurate, mercuryless transmitters. They are small, light, easy to install, use and maintain, have a low air consumption, a high temperature rating and can withstand the application of full rated pressure.

Write For Bulletin 2291-1 (liquid level) or Bulletin 2290A (high range) to Honeywell-Brown Ltd., 1 Wadsworth Road, Perivale, Middlesex. Offices in principal cities of the United Kingdom and throughout the world.

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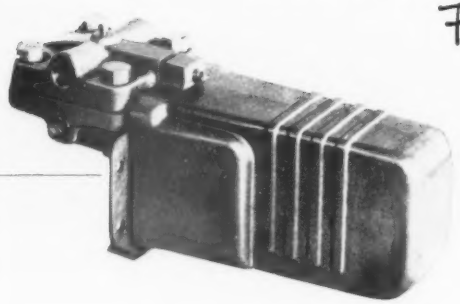
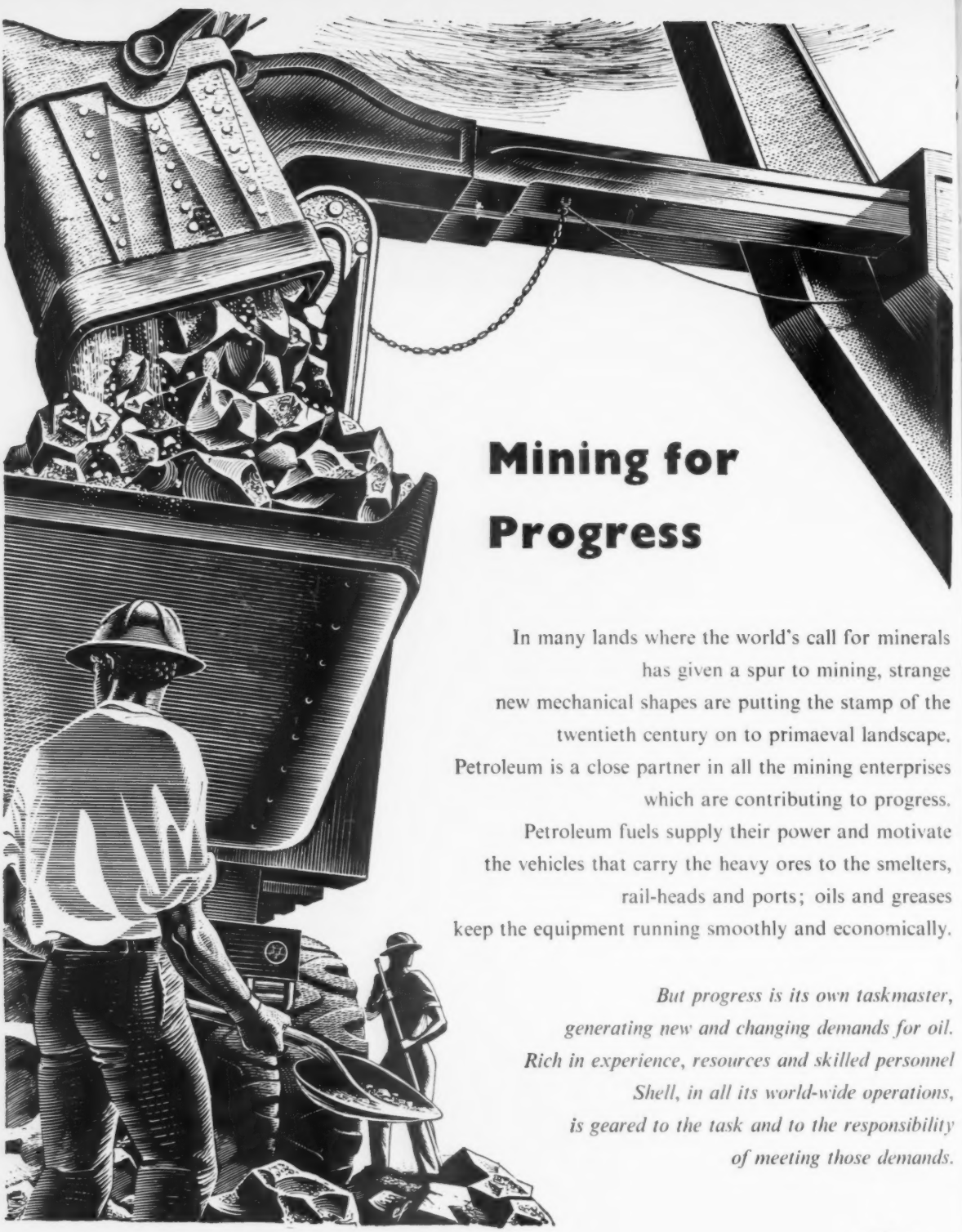
First in Controls



HIGH RANGE

100-1000 ins. w.g.



Mining for Progress

In many lands where the world's call for minerals has given a spur to mining, strange new mechanical shapes are putting the stamp of the twentieth century on to primaeval landscape. Petroleum is a close partner in all the mining enterprises which are contributing to progress. Petroleum fuels supply their power and motivate the vehicles that carry the heavy ores to the smelters, rail-heads and ports; oils and greases keep the equipment running smoothly and economically.

But progress is its own taskmaster, generating new and changing demands for oil. Rich in experience, resources and skilled personnel Shell, in all its world-wide operations, is geared to the task and to the responsibility of meeting those demands.

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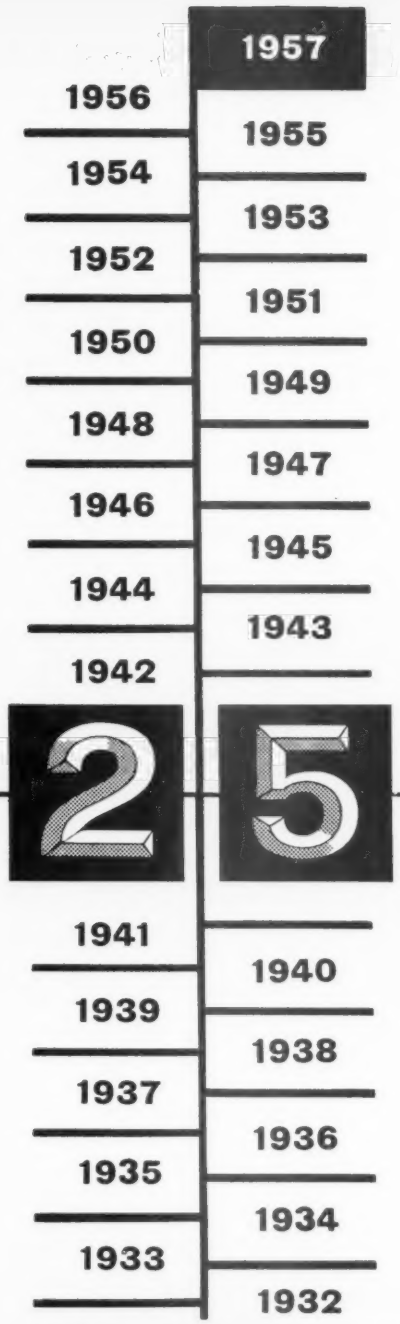

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From small beginnings in 1932, F. Perkins Ltd. have popularised Diesel engines with constantly increasing success. Perkins Diesel engines are now at work in no fewer than 423 different applications.

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Fully in accordance with the requirements of British Standard 1414, and the leading Oil Companies' individual specifications.

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Accurate control of all constituent materials used in construction ensures that the valves are consistently up to specification.

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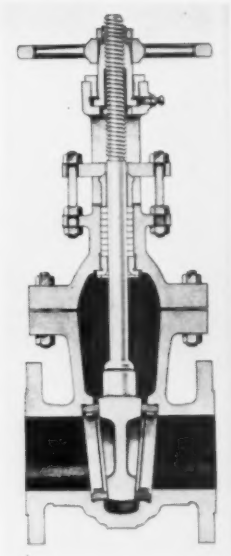
Sizes 2" to 12" in Class 150 lb. and Class 300 lb. The standard trim material is the 11-13% Chrome Stainless Steel, but alternative materials can be offered when necessary.

DIMENSIONS IN INCHES

	Bore	Flange Diameter	Flange Thickness	F to F	Raised Face Dia.	Raised Face	Height
CLASS 150	2	6	¾	7	3¾	1/16	18¾
	3	7½	¾	8	5	1/16	22¾
	4	9	15/16	9	6 7/16	1/16	27
	6	11	1	10½	8½	1/16	35¾
	8	13½	1⅛	11½	10¾	1/16	45
	10	16	1 3/16	13	12¾	1/16	53¾
	12	19	1¼	14	15	1/16	60¾
CLASS 300	2	6½	¾	8½	3¾	1/16	20¾
	3	8¼	1⅛	11½	5	1/16	24¾
	4	10	1⅛	12	6 7/16	1/16	30¾
	6	12½	1 3/16	15¾	8½	1/16	39¾
	8	15	1⅜	16½	10¾	1/16	47½
	10	17½	1⅜	18	12¾	1/16	56¾
	12	20½	2	19½	15	1/16	63¾



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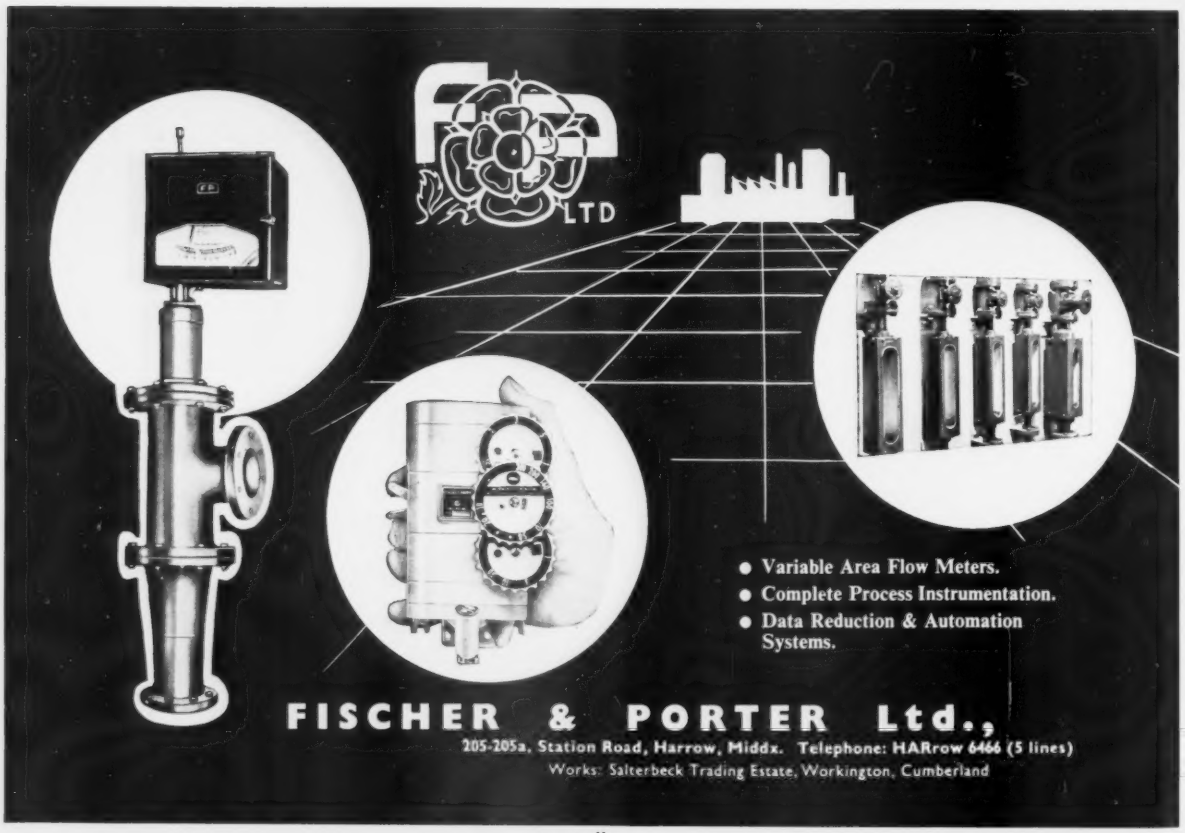
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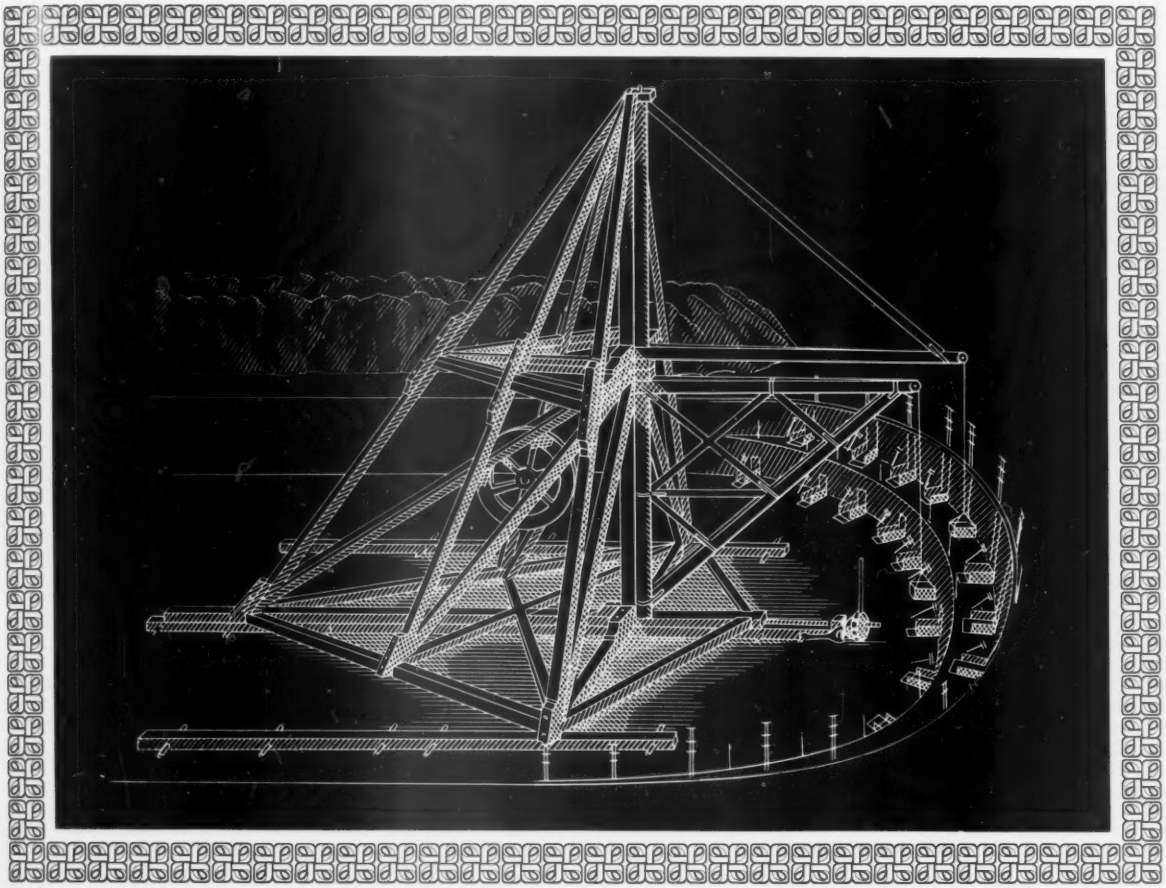

From a Science Museum Photograph

How to build a refinery in 1492

While Christopher Columbus was discovering the source of dollar oil, Leonardo da Vinci was unconsciously contributing by his genius to the building of Mobil Oil Company's sterling-area refinery at Coryton. As this drawing for a two level bucket excavator shows, earth-shifting problems have not changed in 500 years, and the methods of solving them are basically the same. What has enabled modern man to *do* what Leonardo da Vinci planned is the advent of adequate sources of power. It was 250 years after Leonardo da Vinci's death before men began to use the power that lies in coal, and another 100 years before the immense capabilities of mineral oil for power and lubrication were discovered. At the beginning of the oil epoch Vacuum Oil Company—now Mobil Oil Company—was founded. In the 90 years that have followed, the company has pioneered many of the technological advances that have enabled Leonardo da Vinci's dreams to become the commonplace of this modern age. Today, Mobil Oil Company products, marketed under the Mobil and Flying Red Horse trade marks, are known and used throughout the world. And throughout the world they set the standard of quality for products of their kind.

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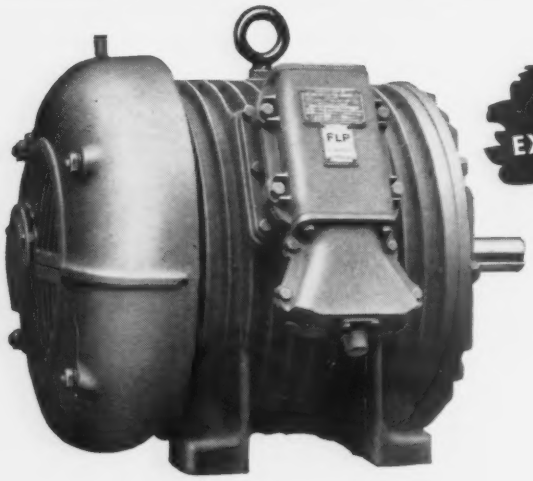

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The reinforcement of branch and junction pieces in steel pipes for a long time presented a difficult problem ; some years ago our Research department investigated various types in current use and evolved a design of their own which has proved highly satisfactory. This, known as the 'triform' reinforcement, embodies three horseshoes embracing the junction between the pipes.

To test the adequacy of such reinforcements against internal pressure, special testing pumps are in use in our Research department at Corby ; these are capable of exerting pressures up to 27,000 lb./sq. inch under sensitive and accurate control.

The illustration shows such a test being carried out on a welded 'Y' piece with a triform reinforcement. Before internal hydraulic pressure is applied the 'Y' piece is coated with plumber's resin. As the pressure increases a stage is reached when small cracks, indicating the presence of Lüders' slip lines in the material, appear in the resin (see insert) thereby showing those points at which yielding has occurred. From the disposition of these slip lines much can be learned about the stresses in the material, and the information obtained leads to efficient and simple designs of adequate strength.

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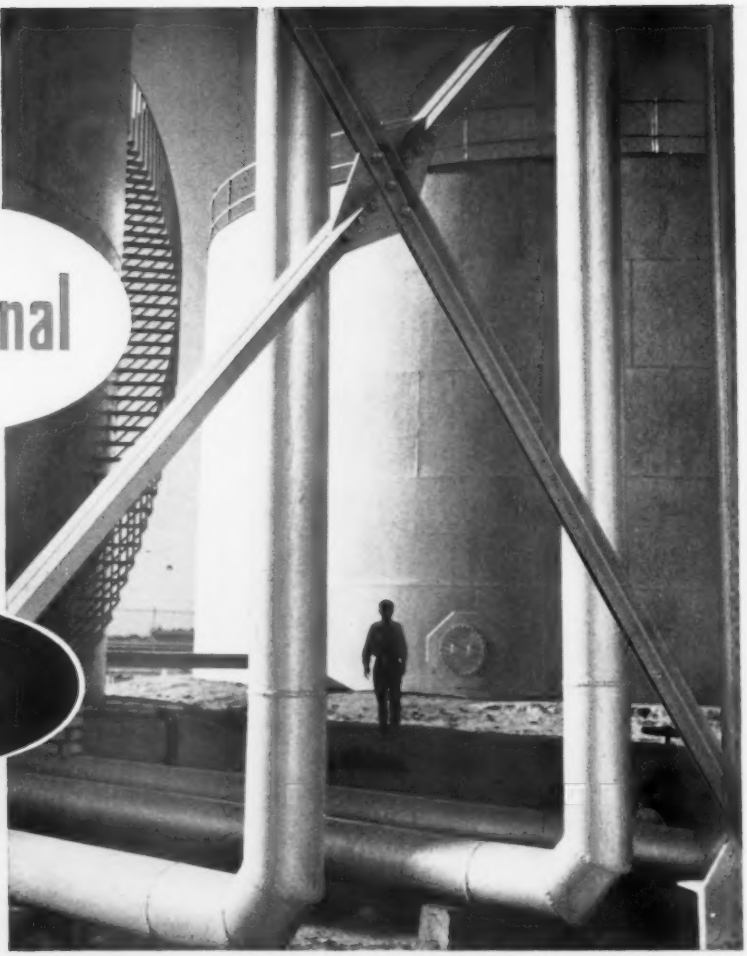

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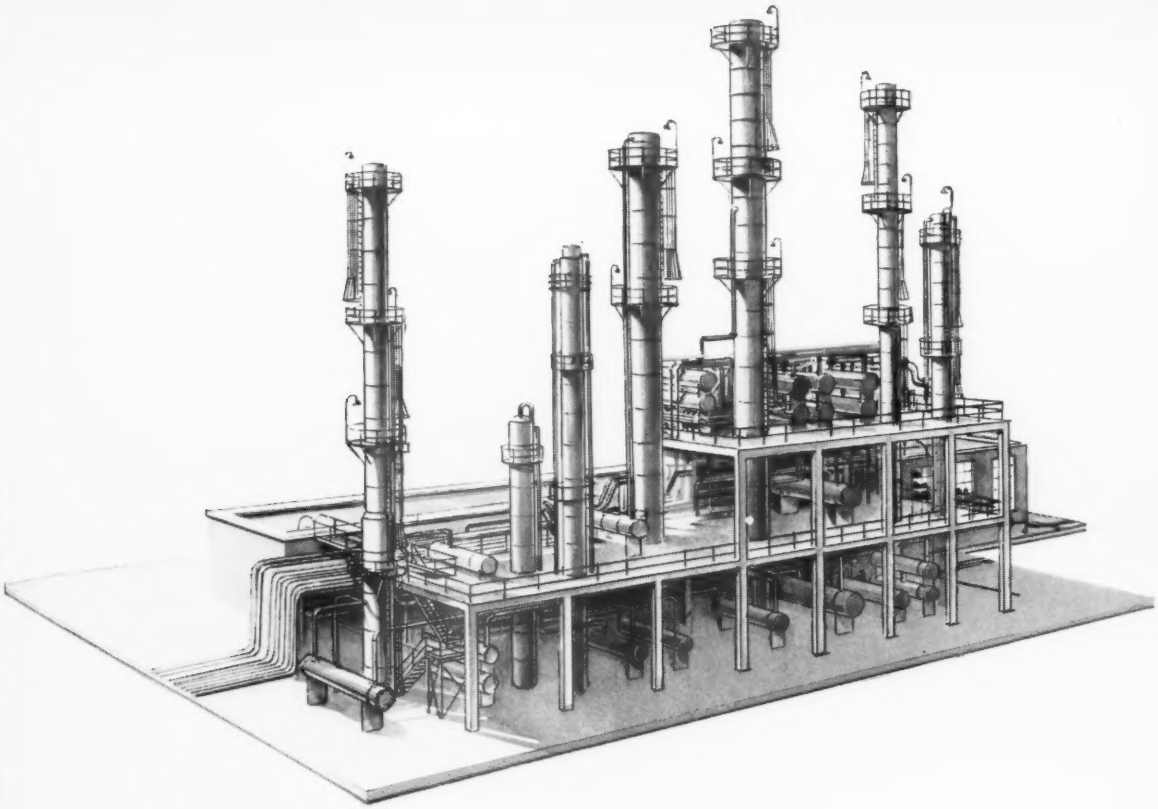

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The British Petroleum Company Limited has awarded us the contract for the engineering design and procurement of its first UDEX plant. The unit recovers a highly aromatic fraction for use in aviation fuel by the extraction process licensed by the Universal Oil Products Company.

This plant is one of several process units that we are presently engineering for BP Refinery (Kent) Limited.

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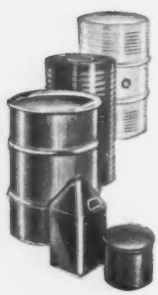

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